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TABLE OF CONTENTS

Analysis of VoIP Signal Processing for Performance Enhancement

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Abstract

The present paper outlines the voice over internet protocol service, various features and services provided by VOIP technology, The quality of voice over IP is evaluated based on packet-loss rate, delay, jitter and echo compensation. In this paper we discuss viability of real time processing of adaptive voice over IP using adaptive rate control algorithms. Finally, performance analysis of LMS, Sign-Error LMS algorithms for AVOIP is presented in this paper.

Keywords: AVOIP, LMS, NLMS, Sign-Error LMS

1. Introduction

Voice communication over internet not be possible without a reliable data network, this was first available when distributed network topologies were used in conjunction with data packets. Early network used single centre node network in which a single workstation (Server) is responsible for the communication. This posed problems as if there was a fault with the centre node, (workstation) nothing would work. This problem was solved by the distributed system in which reliability increases by spreading the load between many nodes. The idea of packet switching & distributed network were combined, this combination were increased reliability, speed & responsible for voice communication over internet. Voice-over-IP (VoIP) These data packets travel through a packet-switched network such as the Internet and arrive at their destination where they are decompressed using a compatible Codec (audio coder/decoder) and converted back to analogue audio. [1]

2. Adaptive VoIP

The aim of voice transmission over IP is to find the technical solution of the problems which affects the QoS of VoIP network like delay, jitter, delay variation, packet loss, speech compression and offer a QoS under most network conditions. So our overall objective is to reach the high quality level of service provided by VoIP. To achieve this quality level a new approach is presented known as 'adaptive VoIP' , whose basic idea is the adaptation of source coder to the present state of the network if network is congested the speech coded at lower bit rates and when network is lightly loaded then speech is coded at higher bit rates or simply we can say the adaptive nature of the VoIP network. So adaptive VoIP relies on variable bit rate speech coders to generate required bandwidth. Advantage of this adaptive approach is the efficient use of resources of the present VoIP network. To achieve adaptively, network congestion needs to be estimated, a rate control algorithm developed and a variable bit rate speech coder integrated into the system. [2]

Network State Estimation. the source rate depend on the state of the network, requires some way of estimating such state, since the IP service model does not offer congestion notification and the detection of temporary congestions. Based on such measures, the rate control algorithm will select bit rates compatible with the estimated capacity of the network.

Rate control algorithm. Give estimates of the state of the network, appropriate ways to adapt the source rate are then needed. In the case of IP telephony, typical networking objectives, such as maximum throughput and stability, must be considered together with perceptual constraints linked to the desired perceptual quality of service. An increase in bit rate, for instance, generally results in

increased speech quality, but only if the network can sustain the increased traffic. If it cannot, the quality increase will be attenuated, or even transformed into a decrease, by greater average delays and more frequent packet losses.

Variable Bit Rate Speech Coding. Although most speech coding standards are fixed rate, several variable bit rate speech coders are available. A recent example of a variable bit rate solution is the new GSM Adaptive Multi-Rate speech coding standard [3]. In GSM-AMR one of 8 rates ranging from 4.75 kb/s to 12.2 kb/s is selected, depending on the instantaneous condition
of the wireless channel. Another example is the new ISO MPEG-4 audio standard, which includes a variable bit rate CELP speech coder operating at bit rates between 3.85 kb/s
and 12.2 kb/s [6].

3. Adaptive Algorithmic Analysis of VoIP

Adaptive algorithms become the effective part of DSP and its plays a vital role in communication. Least mean squares (LMS) algorithms is a type of adaptive filter used to mimic a desired filter by finding the filter coefficients that relate to producing the least mean squares of the error signal (difference between the desired and the actual signal). An adaptive algorithm is used to estimate a time varying signal. There are many adaptive algorithms like recursive least square (RLS), Kalman filter, least mean square (LMS) etc. the LMS algorithm is most commonly used for various applications.[5]

The LMS algorithm was developed by Windrow and Hoff in 1959. The algorithm uses a gradient descent to estimate a time varying signal. The gradient descent method finds a minimum, if it exists, by taking steps in the direction negative of the gradient. It does so by adjusting the filter coefficients so as to minimize the error. The LMS algorithm approaches the minimum of a function to minimize error by taking the negative gradient of the function. [6]

The Normalized least mean squares filter (NLMS) is a variant of the LMS algorithm that solves this problem by normalizing with the power of the input.Some adaptive filter applications require to implementation of adaptive filter algorithms. This purpose requires a simplified version of the LMS algorithm. Applying sign function to the standard LMS algorithm results three types of LMS algorithm as Sign-error LMS algorithm, Sign-data LMS algorithm, Sign-Sign LMS algorithm In the present paper we analyze only standard LMS and Sign-Error LMS algorithm.[7-8]

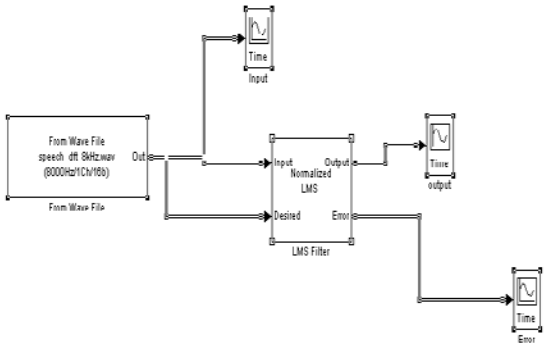

Fig. 1 Model for analysis of adaptive filtering algorithms

Results and Discussion

The spectrum given below shows the analysis of various adaptive filtering algorithms based on VoIP simulink proposed here.

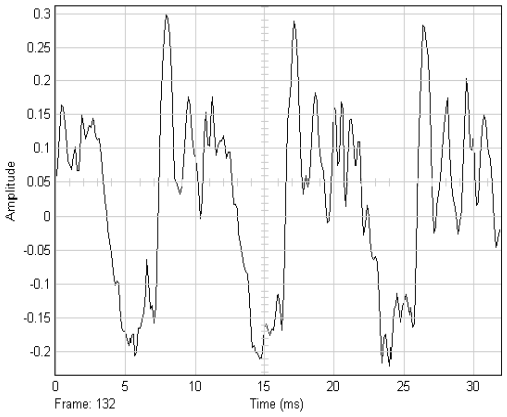

Fig. 2 LMS Input

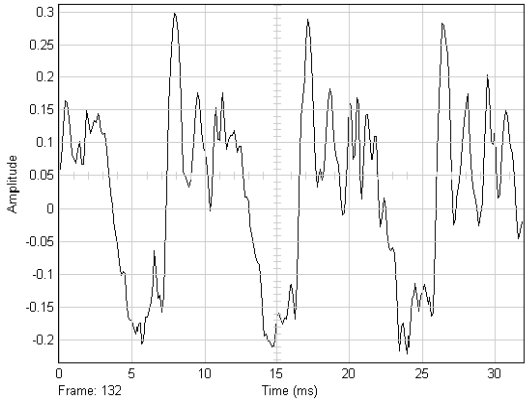

Fig. 3 LMS Output

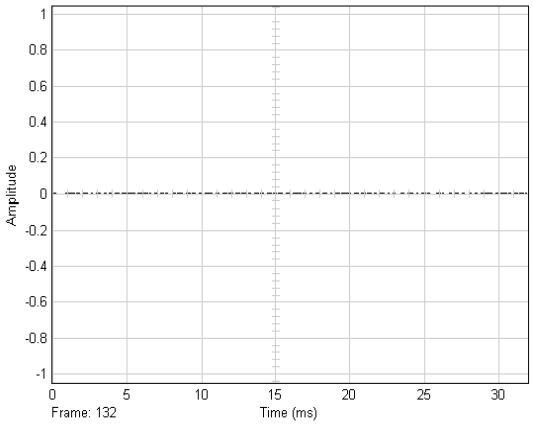

Fig.4 LMS Error

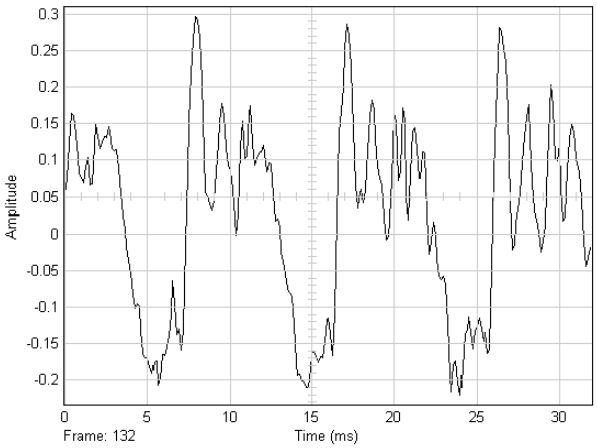

Fig.5 Sign- Error LMS Input

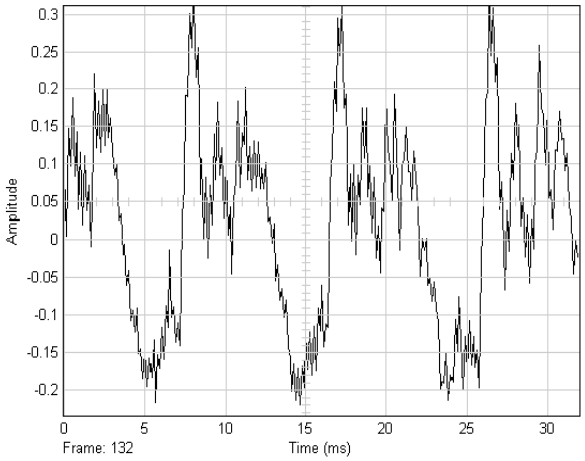

Fig.6 Sign-Error LMS Output

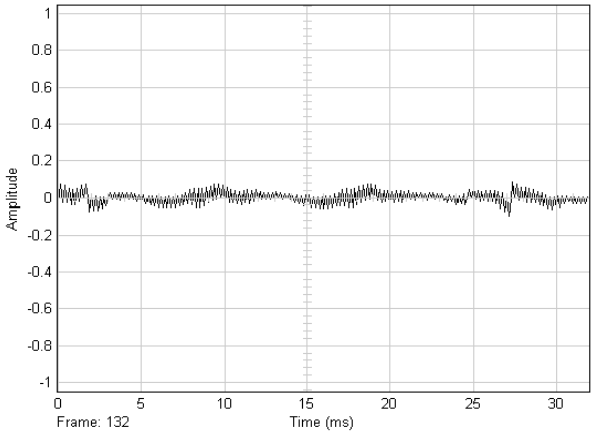

Fig.7 Sign-Error LMS Error

From the above spectrums for LMS, Sign-Error LMS algorithms we analyze that for LMS algorithm there is zero error in the analysis, this is because here we are using same signal for both the input as well as desired signal and using distorted signal.

4. Conclusion

The present paper has highlighted the role of adaptive filtering in VoIP system the different adaptive algorithms such as LMS, NLMS, Sign-Error LMS algorithms have been attempted in the VoIP based simulink model. The work is in progress to incorporate influencing parameters for the performance improvement of VoIP system.

5. Future work

In this paper a simulink model for VoIP is proposed and on the basis of this model our future objective is to analyze the distortion and degradation of the signal. Our ultimate aim is to quality of VoIP signal and reduces degradation, for this work is in progress.

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A Roadmap for Security

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Abstract

The matter of security is important. It is a best approach to provide security of software at early stage of development. Design works as a foundation. Object oriented approach is used to represent the problem domain to clear to develop and understand design. This paper defines complexity as a key factor of security. By proper adjustment of design characteristics and relation among them, complexity can be controlled for acquiring secure software.

Keywords: *Security, complexity, inheritance, cohesion, coupling, polymorphism, association, aggregation, dependency*

1. Introduction

This is modern age where technology is rapidly changing. Human's lives are influenced with the chronological changes. Peoples accepting these changes and hoping that they are reliable, but the failure figure tells the story that there is much to do conserve the sanctity of security and to avoid the repercussions of it. Security is a complex quality that means it needs to be defined by a set of attributes not a single dimension. Security measures are different for different organization. In military it is confidentiality, in media it is integrity measured in terms of security is., in business it is availability. Security as a state or condition is resistance to harm. Security is a system property [1]. Security measures are the concept of protection from intruders and resist system from attack surface.

To develop a secure system is the contributory process of different steps and reflections of each phase is the matter of study to quantify the accurate impacts of security. Providing security is a continuous process for every phase in development life cycle. Microsoft reports that more than 50% of the security related problem for any firm has found at design and architectural level. [2] The designing phase of software engineering is the most beneficial for security practices. The identification of the common designing problems of security in early stage of development helps to analyze the risk evaluation and threat analysis. It also provides better prevention techniques for security measures. Design review validates the requirements and implements the design description. The identification of design flaws by reviewing design phase may reduce the same in further phase of development cycle. The flaw which arises at design like *curse* for the other phase of development life cycle, which is apparent matter of security. As a matter of well established facts, design affects security. Object oriented technology is the emerging trend for software design and development. Object oriented technology provide product with high quality and lower cost. [3].To increase the productivity of software it is mandatory to design and develop secures software. The design hierarchy and relation among them is the key factor of object oriented design.

Design complexity is not only the factor that makes things hard to understand but with enough complexity anything can become harder to understand.[4] It means enhanced complexity increases the chance of fault and attack surface for intruders. Complexity should not be exceeding beyond a certain limit. To increase the security of software it appears mandatory to decrease design complexity of software to identify faults and attack surface. Design complexity of software can be optimized by a proper alteration of design attributes and their relations.

This paper establishes a relation between design complexity and software security. Impacts of design complexity on software security are discussed in section 2. Section 3 discusses the issues with the concept of object oriented deigning approach. Section 4 summaries the contribution. Section 5 is the conclusion part.

2. Is There any Relation Between Complexity and Security?

McGraw also points out as one of three major factors of software security problem the other causes together are Complexity, connectivity and extensibility [5].Design

complexity has a negative impact on security beyond certain acceptable level. At the level of simplicity where software is easy to design and understand, a low rate of faults but maximum possibilities of attack. As design complexity increases the possibilities of faults increases and decreases the security of software. The security of software increases when design complexity decreases but the quality of product should be very competitive. Fig 1 shows a relation between complexity and security. The design complexity impacts on software security. It is a mandatory step to manage design complexity for secure software. Increasing complexity reduces the probability that product development will be successful at fixed level of investment.

Security incidents reported to the computer emergency readiness team coordination center (CERT/CC) that reported vulnerabilities are rapidly in increasing trends. These faults can impacts on design issues, cost and security. [2]. Due to unprecedented growth in code of different versions of window operating system it is very difficult to avoid bugs at 40 million lines of code and complex design. These issues are highly remarkable for security.

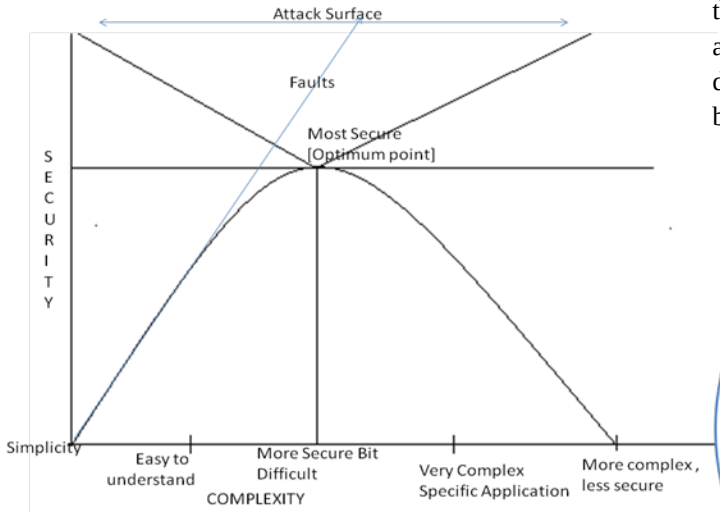

Fig. No.-1

$$S \propto \frac{1}{C} \qquad \text{¥} \qquad C > 0$$

Where, S = Security,
C = Complexity

The design complexity of components lengthens the product development cycle. The profit of the product becomes half due to required no of functions and design iterations at product launch time. A case of HP desk jet 500 series printer loses its profit half due to such extension of development cycle. [2,6]

Another issue related to security that software must be reliable. An unnoticeable error converts into disaster. In 1991 in gulf war, the chopping error that missed 0.000000095 second in every 10^{th} of second, accumulating for 100 hr. made the patriot missile fail to intercept a scud missile.[7]

3. Complexity: In the Mirror of Object Oriented Design Concept:

Object oriented technology has become increasingly more popular language for software development environment. This technology supports to provide software product more secure and more reliable at lower maintenance cost. The object oriented paradigm starts by defining classes (types) of objects that contains related attributes and operations. These classes maintain a hierarchical tree for objects which inherits all the attributes and operations of its parent class. An object can communicate with each other through message passing when certain messages are passed between two objects the objects are coupled.[8] Object oriented design supports the design characteristics abstraction, information hiding, inheritance, polymorphism, cohesion, and coupling and relation among them through classes like association, dependency, qualified association, aggregation, generalization.[9] Fig 2 reference that design complexity is influenced by these attributes and it can be controlled by proper adjustment of these qualities. [10]

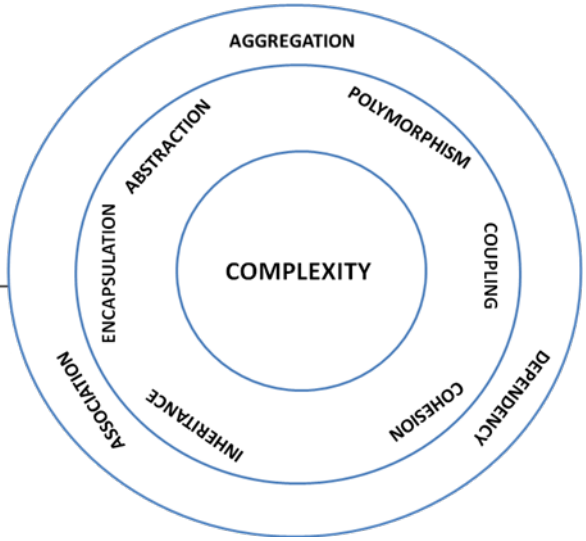

Fig.No.-2

A) Abstraction:

Abstraction is the process of arranging the details of a system so that it can focus on the important details. Abstracting a system can reduce its complexity for each parts of design because it can hide and remove the irrelevant details from each

part of design consideration. When it abstracts something, it hides some details to gain complexity and development productivity advantages.. Abstraction reduces complexity of designing process which is helpful to enhance the security of software at design.[9,11]

B) Encapsulation:

A basic property of an object which wraps the data structure and behavior in a single unit to support a well defined abstraction. Encapsulation provides the freedom to implement the abstraction with interfaces. A class is encapsulated if its internal structure is hidden from other classes. Other objects can use an encapsulated object without knowing the inner workings. The implementation of an object can be changed without affecting any object as long as the interface is preserved. It is a best way to insure the integrity of data is preserved. [9,12]. Limiting the use of class data or related methods, this minimizes the design complexity. This prevents unauthorized access there by giving an additional security to existing application.

C) Inheritance:

In inheritance super class accumulates all the common feathers of subclass. Inheritance forms 'as –a relationship' implying that an object of sub class is also an instance of super class. It also promotes reusability to inherit the feathers of existing class in new one. It forms inheritance hierarchy to find the level of nesting between classes. The more class in hierarchy, the greater no of methods is likely to inherit. Deeper trees constitute greater design complexity and maximum possibilities of having faults, attack surface. At the root class when depth of inheritance is zero fault-proneness will be negligible because of less complexity but due to increased inherited methods and classes design complexity will increased with more faults and attack surface.[8]

D) Polymorphism:

The concept of polymorphism plays an important role to built flexible system. Each objects having the ability about what and how the task will execute. Many forms of a single object are called Polymorphism. It is an ability to take several forms with same method. It allows that an operation on object can be implemented in different ways in different classes that operation depends on that object. Polymorphism is used to reduce complexity of design to preserve the semantics of operations within the object and provide common interfaces to types of object that are similar. [13]

E) Coupling:

The basic concept of coupling is that object interacts to each other that mean the strength of interconnection between objects. If there are two objects and methods of first object uses method or instance variables of another object then these two objects are coupled.[8] strong interconnections shows high coupling between modules which increases the complexity of design, efforts and faults.It is easy to modifiable if the less coupling of the class with other classes. Coupling between object should be minimum for a better understandable design to enhance security.

F) Cohesion:

Cohesion refers to the internal consistency within the parts of design. Cohesion is centered on data that is encapsulated within an object and how methods interact to provide a well defined behavior. Degree of similarity of methods is a major aspect of object class cohesiveness. The objective is to achieve maximum cohesion. It is a property that specifies how much elements are tightly bound to one another. To support a well defined abstraction it is mandatory to have all the elements of each class should highly cohesive. [14] Low cohesion increase complexity. Classes with low cohesion could probably be subdivided into two or more sub classes with increased cohesion.

G) Relationship Between Classes:

A complex system is composed with many objects of different classes. In object oriented design the objects interact to each other to achieve the goal. They use the services of others through message passing. The goal of design is to define the relationship between objects so that it can be implemented properly. The relationship is generally association, aggregation, and dependency. If an object uses the services of other object then there is a link between these objects. Such type of link is called association between two objects. For designing concerned an issue of visibility impacts on association that which object should be visible to whom. Higher order association is more difficult to draw and implement. [15] At design phase association may be evolved as dependency, aggregation or generalization.

Aggregation is a special type of association depicting the whole /part –of relationship between objects. The objects can be representing like a component or entire assembly. Like if an object A is an aggregation of object B and C, then object B and C will generally be within object A which implies containment.

Dependency is the concept to define the dependency relationship between objects. It shows the affects of changes from one class to another. [16]

A class is having a limit to facilitate at once. Smaller the no of classes can more secure, reliable and reusable than large complicated classes, but what is the exact number to break a class is very difficult to predict. Thumb rule says that break the class if attributes, associations are divided into two or more different groups that are not related to each other. [17] These relations impact on design complexity. To reduce design complexity and provide a better security mechanism it is must to adjustment of these relations with classes and better implementation approach for design characteristics.

4. Purpose:

The security of software can be achieved by controlling the complexity. The study present in this paper strengthen that Complexity is a security factor. There has to be always a balance between the complexities of design with respect to security. Security should be so important but design complexity never goes beyond normal acceptable level which looses the model effectiveness in terms of financial viability, user friendliness and in other terms the overall market value of the product. The determination of work as follows:

- Complexity is the key factor of security has been identified.
- Complexity, a key factor for security is major cause of software security issues.
- Complexity can be controlled by proper adjustment of design characteristics and relation among classes at design level.

5. Conclusion:

The design of a software system is the most critical factor affecting the security of software. It can't ignore those factors which impacts on security at design level. Complexity is a factor which affect on security most. By controlling the design characteristics and their relation it is possible to develop a product which is more reliable and secure.

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Designing Usable Websites with the Usability Engineering Approach

Alao Olujimi Daniel

Abstract

Successful web development requires knowledge and skills in many areas, in particular in an aspect of computing called HCI (Human Computer Interaction) and Usability Engineering.

This paper will combine both approaches and also, how to apply usability methods to website design and how usability methods can be integrated efficiently and effectively into each stage of the website design process. Also it will focus on the user-centered approach utilized in the design process. By combining the knowledge gained from a variety of data collection, to obtaining web site user requirements from the data collected and application of usability engineering development process. This will to developing a highly-usable website.

Keywords: Web usability, User centered design, Usability engineering.

Introduction

Nowadays, the ease of use is now becoming more important than in software development. Usability engineering techniques and the application of usability principles will let developers create more usable products by helping them know their audience, evaluating their user interfaces, and redesigning their software based on user feedback. How usable or user-friendly is this product, service or system?. Is it important to know how usable a product is? How can a product be made more user-friendly? That's the primary question most usability research attempts to answer.
Usability or the ease of use has become the most important requirement of designing software and other computer applications. To meet this necessity, usability engineering approach has emerged as a serious field of research. Presently, only a few information systems satisfy usability criteria, resulting in a lot of frustration among users, the reason for this is that the design of these information systems are technology-centered, in which the requirements and needs of the users have not been taken into consideration during the development process. Ceaparu, Lazar (2004) posited that for even experienced users of common personal computers, approximately 45% of their time is wasted with frustrating experiences tied to confusing menus, indecipherable dialog boxes and hard to find functions. These add to the miseries brought by application crashes, network disruptions, and email spam/viruses. While techno-utopians believe that computing technology has steadily improved over four decades, the fact still remains that it is too unreliable, too difficult to use, and too error prone, also the demands and expectations of diverse users have grown faster than the quality of products.

Another problem with most development methodologies is that they start by identifying what functions a system should support (functional requirements) and designers then go on to design and implement the system to satisfy these requirements, Prior to the release of the system, test engineer evaluate whether the system does what it is supposed to do, Unfortunately, this approach omits the human as a part of the system. Real user are never actually observed using the system, also software developers often pay attention to important product attributes such as functionality, reliability, compatibility with existing systems, manufacturability and reusability. Usability, however, which is the key attribute that can determine a system's success, is often overlooked.

There are also many reasons why many products are difficult and frustrating to use. Rubin (1994) identifies the most common reasons as follows:

1. A broader user base with greater discrepancy between user and designer in terms of skills and expectation
2. System components relating to usability are developed independently by specialised teams.
3. During product development, emphasis is on machine or system, not on the person who is the ultimate end user.
4. Design of a usable system is a difficult endeavour, yet many organisations treat it as if it were just common sense.

Banati et al (2006) identified that with many websites offering similar facilities, the user today has become more demanding in respect of the web access. Users prefer visiting those sites, which are easy to learn and operate and are aesthetically appealing. They concluded that the usability of a website plays a significant role in determining the number of hits to a website. That is why the usability

engineering approach to the design of an information system begins by analyzing the user's needs and setting usability goals for the intended system. Nielsen (1993) developed an approach to software design methodology known as the usability engineering lifecycle. This software design methodology has a heavy focus on the user of the software and it also has many forms of usability testing. This methodology begins by analyzing the user's needs and setting usability goals for the intended system. The usability engineering lifecycle as proposed by Nielsen consist of the following eleven stages:

1. Know the user
2. Competitive analysis
3. Setting usability goals
4. Parallel design
5. Participatory design
6. Coordinated design of the total interface
7. Apply guidelines and heuristic analysis
8. Prototyping
9. Empirical testing
10. Iterative design
11. Collect feedback from field use.

The importance of this approach is that one should not rush straight into design and a lot of work should be done at the beginning on getting to know the user, gathering requirements and setting usability goals. Usability engineering involves several methods, each applied at appropriate times, which includes gathering requirements, developing and testing prototypes, evaluating design alternatives, testing with users to establish usability problems in the design, redesigning and addressing problems uncover from usability evaluation. It is an iterative design process.

Objectives of This Study

1. It is the goal of this study to help developers realize that developing a computer application or a web site is not something to be done at the last minute.
2. To teach programmers on how to apply human factors principles and guidelines in the design and critical evaluation of interactive designs
3. To show the importance of an iterative and evaluation-centered life cycle for website or information system development.

What is Usability?

Usability in ISO/IEC 9126 is defined as "The capability of the software product to be understood, learned, used and attractive to the user, when used under specified conditions". Usability can further be defined as a quality attribute that assesses how easy user interfaces are to use. The word "usability" also refers to methods for improving ease-of-use during the design process.

Usability Metrics

Different scientists have proposed different criteria to measure usability, but it can generally be measured by the following metrics:

i. **Learnability**: How easy is it for users to accomplish basic tasks the first time they encounter the design?

ii. **Efficiency**: Once users have learned the design, how quickly can they perform tasks Memorability: When users return to the design after a period of not using it, how easily can they reestablish proficiency.

iii. **Errors**: How many errors do users make, how severe are these errors, and how easily can they recover from the errors?

iv. **Satisfaction**: How pleasant is it to use the design?

Factors Influencing Web Usability

Banati et al (2006) in their work on evaluating web usability from the user's perspective stated the factors which can influence the usability of a website as follows:

a) Stakeholders of the Website: A stakeholder is an individual or an organization who is affected by the performance of the website. There are three main categories of the stakeholders, " the actual users", " the designers" and " the organization hosting the website". All these perceive usability of a website in a different light.

b) User Profile: The age and the cultural upbringing of the user influences the way a user uses a website.

c) User Experience: The experience of user includes different parameters such as the computer knowledge, the amount and the frequency of usage of Internet by the user and the kind of work the user uses the Internet for. On the basis of experience the users can primarily be classified into novice, expert and professional users.

d) Type of website: Websites can primarily be classified into 3 main categories, the information-oriented websites, the service-rendering websites and the business-oriented websites. This classification is based on the prime purpose the website is intended.

What is Usability Engineering Approach?

"Usability Engineering is an approach to the development of software and systems which involves user's participation from the outset and guarantees the usefulness of the product through the use of a usability specification and metrics" (Faulkner, 2000). It is an approach to the development of information system, with a greater user involvement in the design process and with a greater concern for the usability of the system.

Faulkner (2000) also presented the various stages of the usability engineering lifecyle task and the information produced that could be used in designing usable websites in a table as shown in figure 1 below.

Task	Information Produced
Know the user	
	User characteristics
User background	
Know the task	
User's current task	
	Task analysis
User requirements capture	
	User requirements
Setting usability goals	
	Usability specification
Design process	
	Design
Apply guidelines, heuristics	
	Feedback for design
Prototyping	
	Prototype for user testing
Evaluation with users	
	Feedback for redesign
Redesign and evaluate with user	
	Finished product
Evaluate with users and report	
	Feedback on product for future system

Figure 1: table showing Faulkner's various stages of the usability engineering lifecyle.

Usability Engineering Approach is a new and promising method of designing software/systems that are easy to use based on customer data and feedback.

Jean E Fox, (2000) talked about the use of usability principles in designing a user interface in his paper on Usability methods for designing a computer-assisted data collection instrument, he concluded that from the start, the development process should employ a "User-centered design approach, meaning that strong emphasis should be placed on meeting the needs of the users and involving them throughout the design and development. This will lead to producing a highly usable product. Battilana (2008) in his paper on "User centre design and Usability: its role in a project" postulated that user centred design is a process focussed on the design of information systems that cater for the end user for the purposes of most effective and efficient way of maximising usage. According to Deborah J Mayhew, Usability Engineering approach to software design is necessary to avoid the following problems: Low productivity, Costly User errors, High training cost, High customer support cost. Dedorah J Mayhew also in her work about usability approach to software development came out with a methodology for producing a highly usable system also called "The Usability Engineering Life Cycle", it is made of the following steps:

1 Obtaining Usability goals from requirements analysis and using it to drive the design.

2 Applying a structured approach to User Interface design.

3 Applying iterative evaluation techniques towards usability goals.

The usability engineering process for developing an information system is presented as shown in figure 2.

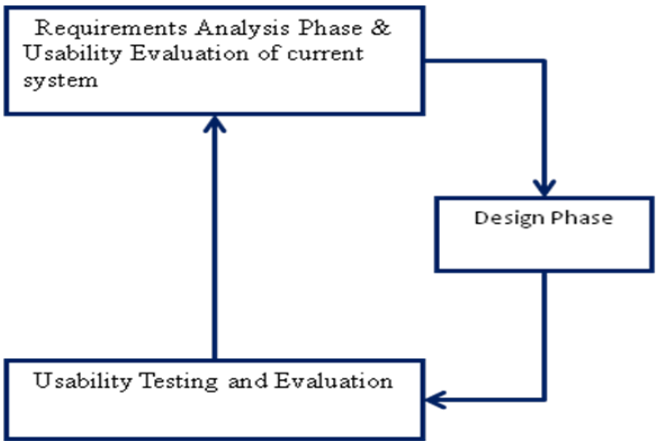

Figure 2: Usability Engineering process (Self Adapted)

The process shown above is an iterative design process which will analyse/design, evaluate/decide, and redesign to ensure that most usability problems are covered in the software development process.

This model also shows most of the factors that should be considered before designing an information system, these are results of evaluating previous version, guidelines and

standards based on human factor research, requirements derived from task analysis, experience with other systems.

In other words, it is now possible to design very good information systems whereby the ease of use of these information systems can only be guaranteed if it is design and developed with a thorough knowledge of who the users are, what task they want to achieve, that is using the usability engineering approach.

Benefits of Usability Engineering

The benefits derived from using the usability engineering approach are:

- It saves cost
- It minimizes application maintenance
- It improves quality
- It increases productivity
- It minimizes training time
- It increases customer satisfaction

Interfacing Usability Engineering in Web Development Process

The stages involved in the design of a website design are Planning, Analysis, Mockups and Prototypes, Production, Testing, Launch, and Maintenance. Some of these stages involve usability evaluation and redesign. Following is a summary of these stages and some of the techniques that can be use to integrate usability into the development process.

Planning

During the planning phase, a project plan is formulated with information about budget, necessary resources (e.g. software), and personnel who need to be involved. At this point, a usability plan is created to clearly specify the target user population, their expected use of the website, and the type and depth of usability evaluation to be performed.

Analysis

In an initial design session with the client, requirements are determined with help from an interview form which identifies the main user requirements. When users are accessible, straightforward interviewing and questionnaire approaches can be used to gather further user requirements. Technical requirements must also be determined early, such as the need for special database, multimedia or security elements. Although somewhat orthogonal to usability, the available technologies can impose severe restrictions on interface design. With requirements in hand, usage scenarios, user-modelling, and other forms of analysis can be conducted as needed.

Mock-ups and Prototypes

Simple sketching and Paper prototyping involves creating mock-ups of the system screens with enough detail to demonstrate the system. Users work through scenarios on the system while a facilitator shuffles screens. These drafts and prototypes can then be evaluated using functional checklists, usability inspection checklists, task analysis, and with user testing and user feedback and redesigning. Effort should be made to arrive at a final design by the end of this stage.

Production

As design documents and mock-ups are finalized, the designer of a website refer to sets of rules (for content such as text, graphics etc) to develop the details of the design and transform that design into a final system.

Testing and Launch

Usability testing should be done throughout the production process, and meeting usability spe cification determines when a website can finally be launched. Iterative Usability testing and client feedback are also crucial to identifying final problems.

Maintenance

Website maintenance should be accounted for during the initial planning stage, but this can change during the course of product development. Documentations and design guidelines developed during the production process can be used for maintenance purposes.

Twelve Guidelines for Developing a Usable Web Site

1. Involve users from the beginning by:

1. Discovering their mental models and expectations
2. Including them as an integral part of the design/development team
3. Observing them at their workplace, analyzing their tasks and goals
4. Collect feedback via walk-through, paper prototypes, think-aloud sessions, and other methods

2. Know your users profile

Ask questions such as the following and use the answers to guide development and design decisions:

- How much experience do the users have with: Computers and The Web
- What are the users' working/web-surfing environments?
- What hardware, software, and browsers do the users have?
- What are the users' preferred learning styles?

- What language(s) do the users speak? How fluent are they?
- What cultural issues might there be?
- What relevant knowledge/skills do the users already posses?
- What do the users need and expect from this web site?

3. Analyze user tasks and goals

Observe and interact with users (preferably at their workspace) as you attempt to answer questions such as:

- What are the tasks users need to perform; how do they currently perform these tasks?
- Why do the users currently perform their tasks the way they do?
- How do users discover and correct errors?
- What are the users' ultimate goals?

4. Test for usability—repeatedly!

It is important to conduct usability testing throughout the development cycle. Usability testing is the only way you can know if a particular site meets users' needs.

5. Visibility

Make important elements such as navigational aids highly visible so users can determine at a glance what they can and cannot do.

6. Memory Load

Make screen elements meaningful and consistent across the site to reduce memory load. In this way, users do not have to remember what the elements mean from one page to another. Relate new items and functions to ones the user already knows by maintaining a consistent page look and layout.

7. Feedback

Provide immediate feedback when a user performs an action. For example, when the user clicks a button, something on the screen should change so the user knows the system has registered the action.

8. Orientation/Navigation

Help users orient themselves by providing the following navigational clues:

- Descriptive links
- A site map
- Obvious ways to exit every page
- Clearly visible elements on each page that inform users where they are in relation to other pages and how to navigate to other pages

9. Errors

Minimize user errors by avoiding situations in which users are likely to make mistakes. Also try to accommodate incorrect actions by users so they can recover quickly.

10. Satisfaction

Make your site pleasant to use and view. Users' satisfaction with the interface influences their

- Perception of ease-of-use.
- Motivation for learning how to use the site.

11. Language

You can improve usability by incorporating the following stylistic elements:

- Concise language
- Everyday words instead of jargon or technical terms

Because the Internet crosses cultural and national boundaries, be careful with ambiguity. The following stylistic elements can be misinterpreted easily:

- Humour (Humour have different meanings across cultures).
- Metaphors
- Icons
- Idioms

12. Visual Design

The aesthetics of a website interface play an important role in communicating information and tone to your users effectively. As you develop your site, some visual design strategies should be taken into consideration

Conclusions and Recommendations

The significance of this study is most appropriate to product developmental processes. Application of the twelve guidelines stated in the study will lead to developing highly usable websites. The use of the usability engineering approach to web development offers many benefits, among them are: reduction of failed products, reduction in development time and costs, reduction in training and support costs for end users, increased sales and revenues for website owners and increased productivity.

The usability engineering approach is highly recommended when designing not only websites but also other types of information systems because users are actively involved in the design and development of the product, this will lead to developing a highly usable product compared to most other design methodologies where designer often assume a lot about the users and then designing a product which users will not find easy to use.

This study recommends that users need be taken into consideration and also identify what characterizes usable websites, problems of usability, qualities and all that is involved in the developing a highly usable website.

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On Line Analytical Mining of Web Usage Data Warehouse

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Abstract

With the rapid growth of World Wide Web and its access, web logs are emerged as huge data repository of page access information which when mined properly can help improve system design, better marketing decisions etc. On Line Analytical Mining (OLAM) is utilized in many areas. But it is not utilized in the field of web usage mining. If data in web logs can be represented in the form of data warehouse (data cube) we can utilize OLAM. The primary requirement in the construction of Multidimensional Data Cube is identification of dimensions and measures. In this paper we present the low cost technique of Web log data mining by multi-dimensional analysis of Web log data. At first, we suggested the dimensions and measures in web usage data warehouse and then we proposed how does On Line Analytical Mining (OLAM) can be applied on web usage data warehouse? Which type of pattern analysis it can perform on web logs? And what are the advantages and disadvantages of using OLAM on web usage data warehouse.

Keywords: Web usage mining, OLAM, Web usage Data warehouse, data cube, dimension and measure.

1. Introduction

The huge development in the technology provides a great boost to the database and information industry, and makes a large number of databases and information repositories available for transaction management, information retrieval, and data analysis. Data can now be stored in many different kinds of databases and information repositories. One such data repository architecture that has emerged is the data warehouse.

We can define Data warehouse as "a huge repository of multiple heterogeneous data sources organized under a unified schema at a single site in order to facilitate management decision making" [1]. Once the Data warehouse is constructed we apply intelligent methods called data mining techniques to extract data patterns. In general there are two levels of data mining-

- Descriptive level
- Predictive level

Descriptive level is more interactive, temporary and query driven [1]. In descriptive level data mining data are presented in multidimensional data cubes and traditional analysis and reporting tools that are provided by OLAP techniques are used [2]. It is known as OLAM (On Line Analytical Mining). Predictive level data mining is however more automatic. In predictive level different data mining algorithms are used to discover new implicit patterns.

The World Wide Web provide rich, worldwide, on-line information services, where data objects are linked together to facilitate interactive access. Users navigate from one web page to another to search the information of his or her interest. The users' accesses to the web pages are recorded into a file called web logs. Web logs provide a huge repository of page access information which when mined properly can help improve system design, better marketing decisions etc. If data in web logs can be represented in the form of data warehouse (data cube) we can apply the OLAP techniques to analyze web usage patterns. Hence data warehouses, data cubes and OLAP techniques have emerged as a scalable and flexible approach to mining Web log files. Han et al. [3] has shown that some of the analysis needs of Web usage data can be done using data warehouses and OLAP techniques.

2. Problem Statement

Most of the algorithm used for web usage mining reveal only frequency count or frequent access sequences. Some of these algorithms have limitations with regard to the size of the web log files, whether it is physical in size or practical in time because of the low speed of the analysis. In order to reduce the size these algorithms make assumptions that decrease the accuracy of mining. Also, the contents of most web sites change over time, making some parts of Web logs irrelevant for the current analysis. In addition,

the goal of analysis may change over time with the business needs. Hence we can say that current web log analysis tools are limited in their performance, the comprehensiveness and depth of their analysis, scalability and the validity and reliability of their results. Therefore, on the one hand, there is a need, both in terms of memory and disk space, for scalability improvements, and, on the other hand, for the introduction of constraints (such as time constraints, concept hierarchies and frequent pattern templates) into mining algorithms, for discovering relevant and correct knowledge.

3. Data Warehousing and OLAM

Data warehouse generalizes and consolidate data in multidimensional space and provide on-line analytical processing (OLAP) tools for the interactive analysis which facilitates effective data generalization and data mining (OLAM) [4,5,6].

3.1 Data Warehousing

Data warehouse systems provide architectures and tools for business executives to systematically organize, understand, and use their data to make strategic decisions. Data warehouse is constructed using following steps:

- Data Cleaning: Applied to remove noise and correct inconsistencies in the data.
- Data Integration: Merges data from multiple sources into a coherent data store that is data warehouse.
- Data Transformation: Includes normalization and aggregation. Contributes toward the success of the mining process.
- Data Loading: Process that move data from one data system to another system, especially, make the data become accessible for the data warehouse.
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- Data Loading: Process that move data from one data system to another system, especially, make the data become accessible for the data warehouse.
- Periodic Data Refreshing: A data warehouse is populated by performing an initial loading. Then, it is regularly updated during the periodic execution of a refreshment process.

The data in the data warehouse are subject-oriented, nonvolatile, historical and stored in the summarized form [7]. Generally data warehouse is modeled by a multidimensional database structure called **data cubes** (see figure 1 a, b and c)**.** A data cube is defined by dimensions and facts. **Dimensions** can be defined as perspectives (major subjects) or entities with respect to which an organization wants to keep records such as time, locality, item, supplier etc. Each dimension corresponds to an attribute or a set of attributes in the schema, and each **cell** stores the value of some aggregate **measure** called **fact.** A data cube measure is a numerical function that can be evaluated at each point in the data cube space. A measure value is computed for a given point by aggregating the data corresponding to the respective dimension-value pairs defining the given point.

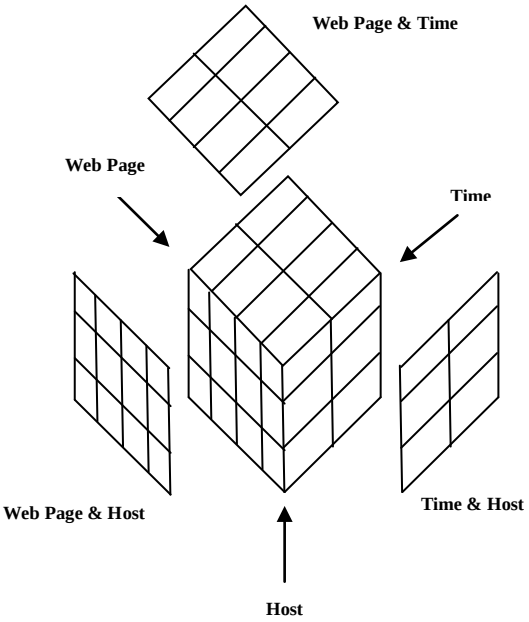


Figure 1(a)

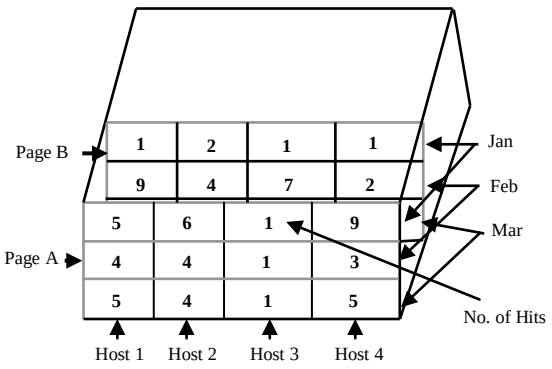


Figure 1(b)

Figure 1, Example data cubes

3.2 On-Line Analytical Mining (OLAM)

Online Analytical Mining also called OLAP mining integrates on-line analytical processing (OLAP) with

data mining and mining knowledge in multidimensional databases. Among the many different approaches of data mining, OLAM is particularly important for the following reasons:

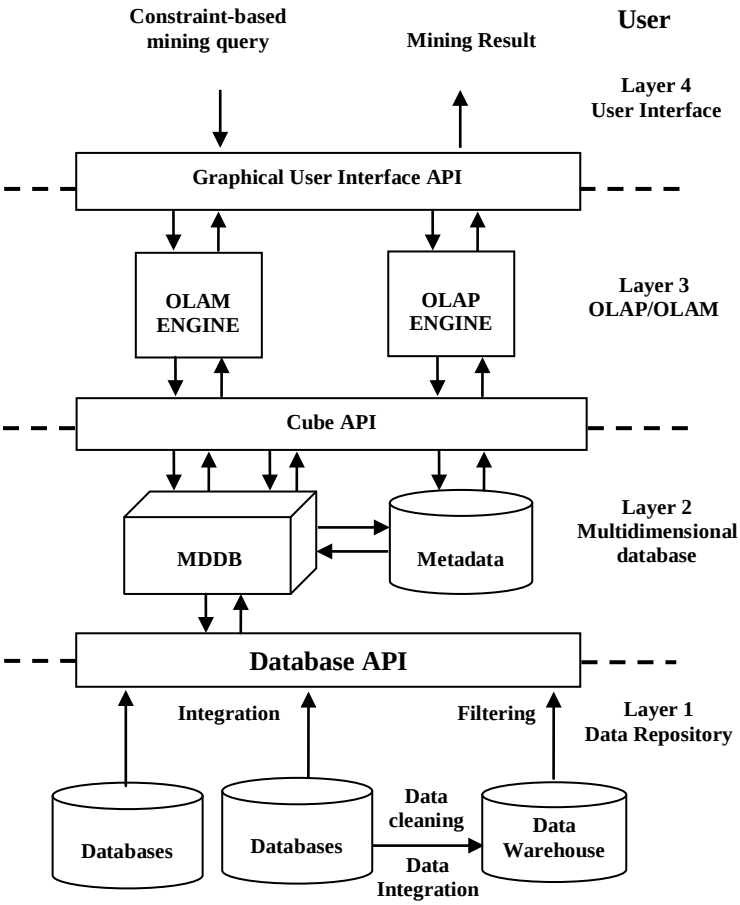


Figure 2, A combined Architecture of OLAM and OLAP**.**

- High quality of data in Data Warehouses.
- Availability of many data warehouses based information processing techniques.
- OLAPbased exploratory data analysis.
- Facility to integrate OLAP with multiple data mining functions on-line.

The architecture for On-Line Analytical Mining is shown in figure 2. Online Analytical Processing or OLAP is part of the broader category business intelligence. OLAP is an approach to quickly provide answers to analytical queries that are based on multi-dimensional data model. Since data warehouses provide multidimensional data views and the precomputation of summarized data in the form of data cubes. As shown in the figure OLAM architecture is similar to OLAP architecture. Since an OLAM server may perform multiple data mining tasks, such as concept description, association, classification, prediction, clustering, time-series analysis, and so on, it usually consists of multiple data mining modules and is more sophisticated than an OLAP server.

OLAP has emerged as a powerful paradigm for strategic analysis of data warehouse systems. The typical applications of OLAP are in business reporting for sales, marketing, management reporting, business process management (BPM), budgeting and forecasting, financial reporting and similar areas. The term OLAP was created as a slight modification of the traditional database term OLTP (**Online Transaction Processing**). OLAP includes Summarization, Consolidation, Aggregation, and facility to view information from different angles[10,11].

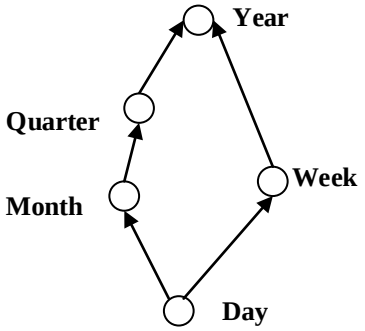


Figure 3, Concept hierarchies for time dimension.

In the multidimensional data cube model each dimension contains multiple levels of abstraction (granularity) called concept. OLAP uses a concept hierarchy (figure 3 shows concept hierarchy for time dimension) that defines a sequence of mappings from a set of low-level concepts to higher-level, more general concepts. The operations that can be performed in OLAP use this concept hierarchy to provide users with the flexibility to view data from different perspectives and allowing interactive querying and analysis of the data at hand. And by this way it provides a user-friendly environment for interactive data analysis. The OLAP operations that help in interactive data analysis are:

3.2.1 Slice

The slice operation is based on selecting one dimension and focusing on a portion of a cube.

3.2.2 Dice

The dice operation creates a sub-cube by focusing on two or more dimensions.

3.2.3 Roll-up

Roll-up, also called aggregation or dimension reduction, allows the user to move to the higher aggregation level.

3.2.4 Drill-down

The drill-down operation is the reverse of a roll-up and represents the situation when the user moves down the hierarchy of aggregation, applying a more detailed grouping.

3.2.5 Pivoting

Pivoting, or rotation, changes the perspective in presenting the data to the user.

To analyze large and detailed databases, users have two options: to purchase a specialized OLAP product or to use OLAP cube functionality available in other commonly used products such as spreadsheets or statistical software packages. Selecting the most suitable OLAP product is a very complex process. Since these products are rather very expensive, it has to be done using the more formal implementation process. The selection of an optimal OLAP product should follow the user needs analysis, system selection, cost/benefit analysis and the whole product life-cycle methodology elaborated for other IT products. However, there is a low cost alternative. Excel users can create OLAP cubes using pivot tables and SPSS users can generate OLAP cubes with SPSS reports. Both Excel and SPSS users can easily create OLAP cubes and manipulate them in a very efficient way. In addition, each of these products offers some specific functionality. For example, in Excel, users can create graphs corresponding to OLAP cubes, whereas SPSS provides more statistics for analyzing data in OLAP cubes.

4. OLAM on Web Usage Data

In this section we present how web log data can be converted into data warehouse (some of the researchers named it webhouse [8, 9]) and how can we apply OLAM technique to mine interesting patterns?

4.1 Web Usage Data warehouse and OLAM

Data stored in web logs can be cleaned, preprocessed and integrated into one huge data repository that is data warehouse. And then OLAP techniques can be applied to mine useful access patterns. The whole process is shown in figure 4.

4.1.1 Data Preprocessing:

Data collected in the web logs are filtered to remove irrelevant information and a relational database is created containing the meaningful remaining data. This database

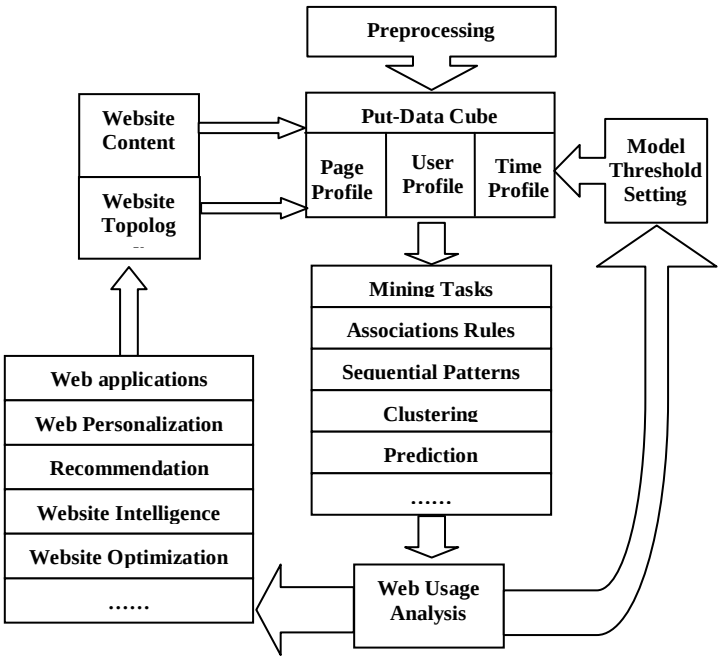


Figure 4, The multidimensional model for web usage mining.

facilitates information extraction and data summarization based on individual attributes like user, locality, time etc. Some of the filtering that is done by many web log mining tools but not adopted in OLAM is:

- Remove the logs about the graphics, sound and video pages. The logic behind this is that these pages are part of a web page so they are requested in order to display the actual page. But in OLAM we are interested to keep these entries because we believe that entry in the log about these pages can give us interesting clues regarding web site structure, traffic performance, as well as user motivation. Also, one user action can generate multiple and some of them are requests for media pages. Some of these logs are important to realize the intended action of the user.
- Elimination of log entries generated by web agents like web spiders, indexers, link checkers, or other intelligent agents that pre-fetch pages for caching purposes. But we are interested in keeping these logs as they are helpful to analyze web agents' behavior on a site and compare the traffic generated by these automated agents with the rest of the traffic.

- Our concentration in this step is to reduce the elimination because most of the data are relevant in any way. Also, in data warehouse we do not have the

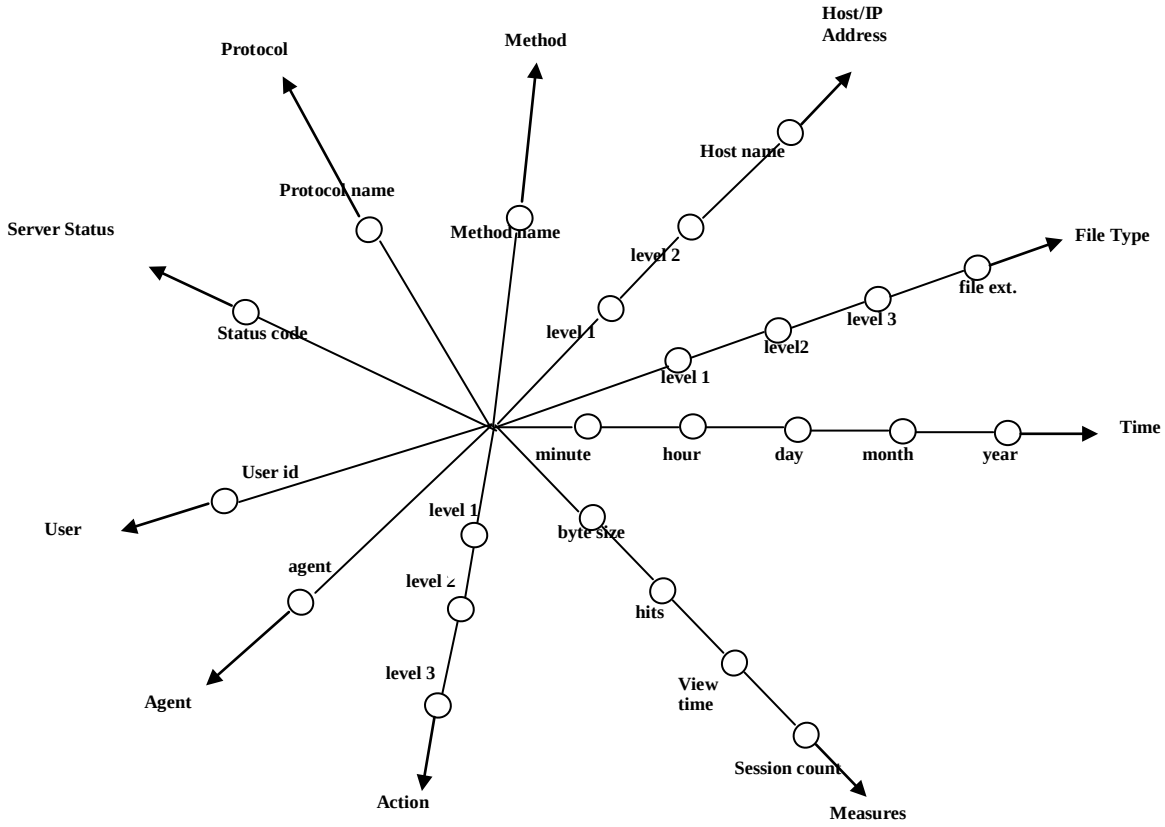


Figure 5, Fragment of Relational Database containing preprocessed web logs

problem of space that is the biggest reason of the data elimination in these mining algorithms. The data filtering we adopted mainly transforms the data into a more meaningful representation.

	A	B	C	D	E	F	G	H	I	J	K
1	Year	Mon	Day	Hou	Minu	Secon	userII	nbyte	protocol	pathII	session
492	2004	Feb	23	16	18	18	65	3349889	7	140	116
493	2004	Feb	23	16	18	19	65	3349889	7	140	116
494	2004	Feb	23	16	18	19	65	3347338	7	140	116
798	2004	Feb	23	17	14	2	174	3366721	1	140	219
803	2004	Feb	23	17	14	2	174	3363801	7	140	219
808	2004	Feb	23	17	14	9	174	3329942	7	140	219
3183	2004	Feb	24	13	24	42	761	5254981	1	757	1039

Figure 6, Example concept hierarchy for Web log data cube

After the cleaning and transformation of the web log entries, the web log is loaded into a relational database and some additional data, such as time spent by event, is calculated. Figure 5, shows relational database that contain preprocessed web logs in the form of rows and columns.

4.1.2 Construction of Data Cube

As the preprocessing task is finished we construct a multidimensional data cube and load the preprocessed data from relational data base into it. To construct a web log data cube we must have the knowledge of all the dimensions in which web log data can be arranged and all the possible attributes of each dimension that describe facts. For example the time dimension may have the attributes such as minute, hour, day, month, and year. Attributes of a dimension may be related by partial order indicating a hierarchical relationship among the dimension attributes. Each dimension is defined on a concept hierarchy to facilitate generalization and specialization along the dimension. Figure 6 shows all the dimensions, attributes and concept hierarchy of each dimension.

Each line in the figure 6 represents a dimension and each circle in the line represents an attribute. Each line is representing the concept hierarchy for that dimension. This starnet model in figure 6 shows 9 dimensions and four measures that can be constructed directly from Web log. For more business oriented analysis, other attributes from other data sources,

such as user profile and referrer logs, can be added to this model. Additional attributes may include user demographic data, such as address, age, education, and income and referrer data such as referrer address, local URL can also be added.

After the construction of multi-dimensional data cube various OLAP techniques are applied to provide further insight of any target data set from different perspectives and at different conceptual levels. This counts as summarization function in data mining as well. Some typical summarization includes the following: Byte transferred, Hits count, View time, Session count, Domain summary, Event summary, Request summary.

The multi-dimensional structure of the data cube provides great flexibility to manipulate the data and view it from different perspectives. The sum cells allow quick summarization at different levels of the concept hierarchies defined on the dimension attributes.

Building this web log data cube allows the application of OLAP (On-Line Analytical Processing) operations, such as drill-down, roll-up, slice and dice, to view and analyze the web log data from different angles, derive ratios and compute measures across many dimensions.

4.1.3 OLAM the OLAP mining on web log data

"OLAP is a method for interactively exploring multidimensional data." In multidimensional OLAP analysis, standard statistical measures (such as counts, sum of the bytes transferred) are applied to assist the user at each step to explore the interesting parts of the cube. Web log data cubes are constructed to give the user the flexibility of viewing data from different perspectives and performing ad hoc analytical quires. A user can use the data cube to analyze how overall usage of Web site has changed in the last quarter, to check whether most server requests have been answered, hopefully with expected or low level of errors. If some weeks or days are worse than the others, the user might navigate further down into those levels, always looking for some reason to explain the observed anomalies. At each step, the user might add or remove some dimension, changing their perspective, select subset of the data at hand, drill down, or roll up, and then inspect the new view of the data cube again. Each step of this process signifies a query or hypothesis, and each query follows the result of the previous step[10,11]. The knowledge that can be discovered is represented in the form of rules, tables, charts, graphs, and other visual presentation forms.

Data mining functionalities are used to specify the kind of patterns to be found in data mining tasks. Data mining functionalities, and the kinds of patterns they can discover, are described below:

- **Class Description**:

Data can be associated with classes or concepts. Such as classes of agent include Mozilla, NetScape Navigator etc. It is very helpful to describe individual classes and concepts in summarized, concise and precise terms. Such descriptions of a class or a concept are called class/concept descriptions. These descriptions can be derived via

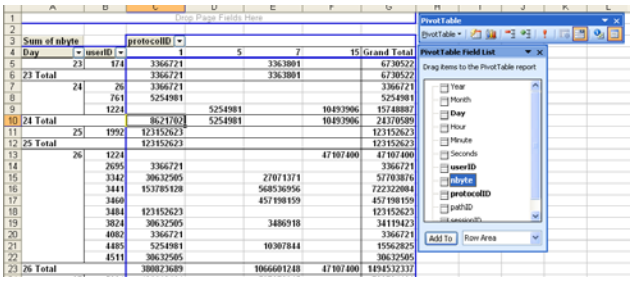


Figure 7, Example data cube created using Pivot Table having Day, UserID, ProtocollID as Dimensions and Number of bytes transferred as measure.

- **Data Characterization**:

It consists of finding rules that summarize general characteristics of a set of user-defined data. The rules are generated from a generalized data cube produced using the web log data cube and the OLAP operations. For example, the traffic on a web server for a given type of media in a particular time of day can be summarized by a characteristic rule.

- **Data discrimination**:

It is done by comparison of the target class with one or a set of comparative classes (often called the contrasting classes). Comparison plays the role of examining the Web log data to discover discriminate rules, which summarize the features that distinguish the data in the target class from that in the contrasting classes. For example, to compare requests from two different web browsers, a discriminate rule summarizes the features that discriminate one agent from the other, like time, file type, etc.

- **Association:**

Mining frequent patterns leads to the discovery of interesting associations and correlations within data. Rule support and confidence are two measures of rule interestingness. They respectively reflect the usefulness and certainty of discovered rules. This function mines association rules at multiple-levels of abstraction. For example, one may discover the patterns that accesses to different resources consistently occurring together, or accesses from a particular place occurring at regular times. Typically, association rules are discarded as uninteresting if they do not satisfy both a minimum support threshold and a minimum confidence threshold.

- **Classification:**

Classification consists of finding a model that describes and distinguishes data classes or concepts, for the purpose of being able to use the model to predict the class of objects whose class label is unknown. The derived model is based on the analysis of a set of training data that is data objects whose class label is known. In web usage mining, classification consists of building a model for each given class based upon features in the web log data and generating classification rules from such models. The models are constructed by analyzing a training web log data set whose class label is known. The classification rules can be used to develop a better understanding of each class in the web log database, and perhaps restructure a web site or customize answers to requests(i.e. quality of service) based on classes of requests.

- **Prediction:**

Whereas classification predicts categorical (discrete, unordered) labels, Prediction models continuous-valued functions. That is, it is used to predict missing or unavailable numerical data values rather than class labels. Prediction involves predicting values or value distributions of an attribute of interest based on its relevance to other attributes. Both relevance analysis and predictive model construction need statistical analysis techniques. For example, the access to a new resource on a given day can be predicted based on accesses to similar old resources on similar days, or the traffic for a given page can be predicted based on the distribution of traffic on other pages in the server directory.

- **Evolution Analysis**:

It describes and models regularities or trends for objects whose behavior changes over time. Time-series analysis is to analyze data collected along time sequences to discover time-related interesting patterns, characteristics, trends, similarities, differences, periodicity, and so on. It may include data characterization, data discrimination, association, classification, and prediction. For example, time-series analysis of the web log data may disclose the patterns and trends of web page accesses in the last year and suggest the improvement of services of the web server.

The kind of patterns listed above can be find out by applying different OLAP operations such as slice, dice, drill-down, roll-up and pivoting. A GUI can be developed to automate the task of applying operations on cube and giving the results. We tried to explain the web log data cube analysis with the help of some examples in following section 4.2.

4.2 Illustrative Example

To illustrate the OLAP mining we used small set of web access logs downloaded free from the internet. This Web logs is of 23 feb, 2004 to 29 feb, 2004 having: 61 KB in size, 36,878 entries which includes 7851 unique host names, 2793 unique URLs and 32 different file types (extensions). Based on the file extensions these files can be grouped into audio, compressed, document, dynamic, html, images, java and video category. The IP addresses are grouped into domains. We considered nine dimensions and four measures to construct Web log OLAP data cubes. The dimensions are time, file, file type, host, method, protocol, agent, action and server status dimensions and measures are bytes and hits, view time and session count.

Sum of nbyte	protocolID				
Day	1	5	7	15	Grand Total
23	3366721		3363801		6730522
24	8621702	5254981		10493906	24370589
25	123152623				123152623
26	380823689		1066601248	47107400	1494532337
27	126642461		672523639		799166100
28	3366721				3366721
29	18721865		3363801		22085666
Grand Total	664695782	5254981	1745852489	57601306	2473404558

Figure 8, Dicing Data cube shown in figure 7 contains two dimensions day and protocolID.

Here we illustrate a simple yet typical example of summarization using OLAP technique (using MS Excel) on web usage data warehouse. In this example, we are interested in finding out how many bytes were transferred (**Web traffic analysis**) on each day of the month over a whole year for a particular protocol, user wise.

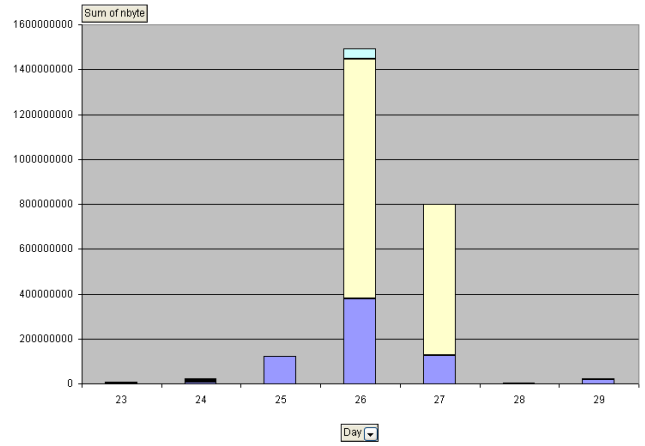


Figure 9, Graphical representation of the data cube shown in figure 8.

Sum of nbyte		protocolID				
Day	Hour	1	5	7	15	Grand Total
23	17	3366721		3363801		6730522
23 Total		3366721		3363801		6730522
24	13	5254981				5254981
	14	3366721				3366721
	18		5254981		10493906	15748887
24 Total		8621702	5254981		10493906	24370589
25	9	123152623				123152623
25 Total		123152623				123152623
26	0	33999226		27071371		61070597
	3	153785128		784653196		938438324
	4	123152623		30721655		153874278
	5			85311019		85311019
	6			125049245		125049245
	12	30632505		3486918		34119423
	15	3366721				3366721
	20	35887486		10307844		46195330
	22				47107400	47107400
26 Total		380823689		1066601248	47107400	1494532337
27	8	126642461		597078945		723721406

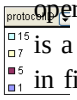
Figure 10, Resultant Data Cube after Drill down to Hours, Minutes and seconds in the time dimension in the data cube given in figure 8.

Sum of nbyte				protocolI				
Day	Hour	Minut	Second	1	5	7	15	Grand Total
23	17	14	2	3366721		3363801		6730522
		14 Total		3366721		3363801		6730522
	17 Total			3366721		3363801		6730522
23 Total				3366721		3363801		6730522
24	13	24	42	5254981				5254981
		24 Total		5254981				5254981
	13 Total			5254981				5254981
	14	1	27	3366721				3366721
		1 Total		3366721				3366721
	14 Total			3366721				3366721
	18	59	15		5254981			5254981
			16				5246789	5246789
			17				5247117	5247117
	18 Total				5254981		10493906	15748887
24 Total				8621702	5254981		10493906	24370589

Figure 11, Shows the rollup operation in the data cube shown in figure 10.

Figure 7 shows part of the Web log cube. This figure shows part of the cube (excel pivot table) with 3 dimensions: DateTime, User and Protocol, where DateTime is at level Day. User and Protocol are in numeric codes (UserID and ProtocolID). For example ProtocolID 1 indicates protocol HTTP/1.1 method GET and server status 200. Server status 200 indicates a successful request, while 403 and 404 are code for request for forbidden URL and requested URL was not found, respectively.

Figure 8 shows the dicing operation on the cube shown in figure 7. This diced cube contains only two dimensions day and protocolID. Figure 9 is a slicing operation performed on the diced data cube. Figure 9 is a graphical representation of the diced cube shown in figure 8. As shown in the figure 9, we can see that no. of bytes transferred on day 23 was very few, which slightly increased on day 24 and 25 and on day 26 it was highest then decreased rapidly. Protocol 7 is used in big data transfers while in most of the data transfer user prefers protocol 1. Graphical representation make easy to perceive the mined data.



Sum of nbyte				protocolID			
Day	Hour	Minute	Seconds	1	5	15	Grand Total
24	13	24	42	5254981			5254981
		24 Total		5254981			5254981
	13 Total			5254981			5254981
	14	1	27	3366721			3366721
		1 Total		3366721			3366721
	14 Total			3366721			3366721
	18	59	15		5254981		5254981
			16			5246789	5246789
			17			5247117	5247117
		59 Total			5254981	10493906	15748887
	18 Total				5254981	10493906	15748887
24 Total				8621702	5254981	10493906	24370589
Grand Total				8621702	5254981	10493906	24370589

Figure 12, Slicing, Data cube on date-time dimension for day 24.

Figure 10, shows the Drill down operations. Here we Drill down the data cube shown in figure 8 into Hours, Minutes and seconds in the time dimension. Figure 11 illustrates the rollup operation over data cube shown in figure 10.

Using slicing operation (as shown in the figure 12) we can focus on the values of the specific cells. In the figure 12 we sliced the data cube in figure 10 for day 24. We can easily see the sum of the byte transferred of day 24 of each hour, minute and second.

Figure 13 shows the pivoting operation. In this example we rotate the two dimensions clock wise as a result the protocolID is now at the y axis and day are at the x axis as shown in the figure 13.

Sum of nbyte	Day							
protocolID	23	24	25	26	27	28	29	Grand Total
1	3366721	8621702	123152623	380823689	126642461	3366721	18721865	664695782
5		5254981						5254981
7	3363801			1066601248	672523639		3363801	1745852489
15		10493906		47107400				57601306
Grand Total	6730522	24370589	123152623	1494532337	799166100	3366721	22085666	2473404558

Figure 13, Shows the pivoting (rotation) operation where protocolID is now at the y-axis and days are at the x-axis.

Slicing, Dicing, Rollup, Drilldown and pivoting operations on a data cube provides great flexibility to an analyst to analyze the mined pattern in different perspective and at the different level of granularity.

We can automate these tasks by developing an interface which provides the possible options and

display in the statistical terms or graphically. In excel this automation can be achieved using macro recording.

In the example discussed above we performed OLAM for Web Traffic Analysis. Similarly by changing the dimensions in the data cube we can also perform other analysis such as transition analysis, trend analysis, frequent access pattern etc.

5. Strength and Weakness of OLAM approach

The capability of OLAP to provide multiple and dynamic views of summarized data in a data warehouse sets a solid foundation for successful data mining. Moreover, data mining should be a human-centered process which does not generate patterns and knowledge automatically but allows user to interact with the system to perform exploratory data analysis. OLAM sets a good example for interactive data analysis and provides the necessary preparations for exploratory data mining.

The disadvantage of OLAP mining is that it still affected by the limitation of log files. In the current scenario these log files have very high data volumes which require implementation of such a Web access analysis engine that can support the high data volumes. Unfortunately, there is several performance and functionality problems that must be addressed before such a web access analysis engine can be implemented.

One such problem is how to handle the processing of very large, very sparse data cubes. Web access analysis introduces a number of fine-grained dimensions (such as seconds in the time dimension: day->hour->minute->second) that result in very large, very sparse data cubes. These very large, very sparse data cubes pose serious scalability and performance challenges to data aggregation and analysis, and more fundamentally, to the use of OLAP for such applications. While OLAP servers generally store sparse data cubes quite efficiently, OLAP servers generally do not roll-up these sparse data cubes very efficiently. For example, a newspaper Web site received 1.5 million hits a week against pages that contained articles on various subjects. The newspaper wanted to profile the behavior of visitors from each originating site at different times of the day, including their interest in particular subjects and which referring sites they were clicking through. The data is modeled by using four dimensions: ip address of the originating site (48,128 values), referring site (10,432 values), subject url (18,085 values), and hours of day (24 values). The resulting cube contains over 200 trillion cells, indicating clearly that the cube is extremely sparse. Each of the dimensions participates in a 2-level or 3-level hierarchy. To rollup such a cube along these dimension hierarchies by using the regular rollup operation supported by the OLAP server requires an estimated 10,000 hours (i.e. more than one year) on a single Unix server. As can be appreciated, the processing time required is unacceptable for the application. Accordingly, mechanisms are desired that can efficiently summarize data without having to roll-up sparse data cubes.

Other than this in OLAP a large mount of information such as how the user filled the tasks, the intension of the users and so on are missing. Some other limitations of this approach are:

- Non symmetric treatment of measure and dimension attributes.
- No navigation approaches for complex hierarchies and exploring multiple data cubes.
- Inability to provide a multiscale view.
- Standard Visualization tools scale poorly.

6. Conclusion

The huge development in the technology provides a great boost to the database and information industry, and makes a large number of databases and information repositories available for transaction management, information retrieval, and data analysis. “Repository of multiple heterogeneous data sources organized under a unified schema at a single site in order to facilitate management decision making“, is known as Data warehouse. Data warehouse is a wonderful resource for data mining. In descriptive level data mining data are presented in multidimensional data cubes and traditional analysis and reporting tools that are provided by OLAP techniques are used. It is known as OLAM (On Line Analytical Mining).

The users’ accesses to the web pages are recorded into a file called web logs. Web logs provide a huge repository of page access information which when mined properly can help improve system design, better marketing decisions etc. If data in web logs can be represented in the form of data warehouse (data cube) we can apply the OLAM techniques to analyze web usage patterns. In this chapter we tried to represent the analogy between the OLAM on normal database and OLAM on web logs. Using the example we try to prove that what actions/operations we can

perform on simple data can also be performed on the web usage data. We first explained how is data preprocessing accomplished? Then how warehouse is implemented using multidimensional data cube? And different operations on data cube with the help of example. Then we presented the analogy for web usage data. We avoid the elimination because each data is important for us. We represented the concept hierarchy for web logs that help to perform various OLAP operations. Which type of patterns can be mined by using these operations are explained with the help of examples? Each technique has its own strength and weaknesses. The biggest weakness is huge web log results in sparse data cube which poses serious scalability and performance challenges.

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An Effective Approach for Post Supervision in Blogosphere

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Abstract

A web log or blog in short is a trendy way to share personal entries with others through website. A typical blog may consist of texts, images, audios and videos etc. Most of the blogs function as personal online diaries while others may focus on specific interest such as photographs (photoblog), art (artblog), travel (tourblog) etc. Another type of blogging called microblogging is well known now-a-days which combines very short posts. Like the developed countries, the users of blogs are gradually increasing in the developing countries e.g. Bangladesh. Due to the nature of open access to all users, some people abuse it to spread fake news to achieve individual or political goals. Some of them also post vulgar materials that make an embarrass situation for other bloggers. The way to overcome this problem is to bring all the post under supervision of the site administrator. But it is totally contradictory to the blog concepts. In this paper, we have suggested an effective approach that would restrict the offensive entries from being posted. These entries would go through a supervision process to justify themselves as legal posts. Here, we have shown that this approach can eliminate the chaotic situations in blogosphere at a great extent.

Index Terms— Blogger, Blogosphere, Post Supervision, Moderator.

1. Introduction

The old fashion of writing diaries is now changed to a new form known as blogging – a modern way of keeping diaries online. It is a platform where bloggers can share their daily lives, thoughts, problems, suggestions to others and blog readers can also post their feedbacks through comments or personal messages. As the users of computer and internet have increased dramatically all over the world, blogging has become a habit to many users. There are more than 189 million bloggers all over the world according to McCann. Besides the developed countries, the people of developing countries are becoming more addicted to blogging day by day. For example, Indian blogosphere comprises more than 2 million blogs today. More than 50,000 people blog regularly in Bangladesh.

Like any other entity, blogs, though increasing popular day by day, are also facing some serious problems which have great impact on overall society. One of the major characteristics of blogs is that it provides open access to all. Anyone can register to a blogsite and he/she can post his personal journal anytime using his/her account. As there is no process of gate keeping on blogging, there is no check on what kind of content is being published by the bloggers.

The world of User Generated Content is full of material which puts negative impact on an individual, place, organization etc. which leads to defamation of somebody [1]. “The blogosphere has created an open, unfiltered megaphone for anyone with a computer and a modem, a striking characteristic of contemporary times is an unseemly incivility.” Says Robert Dilenschneider in his book ‘power and influence’. This incivility includes making an untrue statement to a person or organization that damages the subject’s reputation. Libel and Slander are two subcategories of defamation where first one is committed in printing media such as articles of a magazine or newspaper and the second one is in spoken form such as person-to-person or broadcast over a radio or television channel. Blogosphere very often suffers from defamation in a printed forum. A number of researches are done which include protection aginst spam blogs (Splog) [3, 7], instant blog updating and retrieving [2], providing fast news alert to the RSS feeds subscribers [4]. But no mechanism is proposed to overcome the above prob-

lem. In this paper, we have suggested a new approach which will work as a gate-keeper and will be able to minimize the number of offensive posts and comments.

2 Blogging Communication Model

2.1 Current Blogging System

The following figure illustrates the current blogging system where bloggers directly write their entries using user interface module and submit to the storage database. Immediate, it is published to the desired page. There is no gate-keeping mechanism followed in this process.

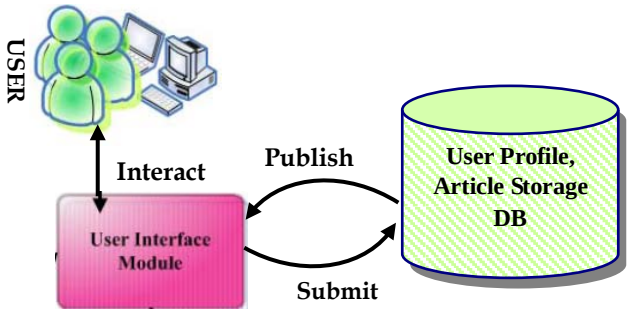

Fig. 1: Traditional Blogging System

2.2 Blogging Sytem under Supervision

This proposed system is improved from the earlier model as each of the post must pass the verification phase. The following figure illustrates the process. In this system, every entry is assessed using an algorithm and if it achieves certain level of scores then will be published directly or directly with a notification. Otherwise it will be pending or rejected on the basis of the score.

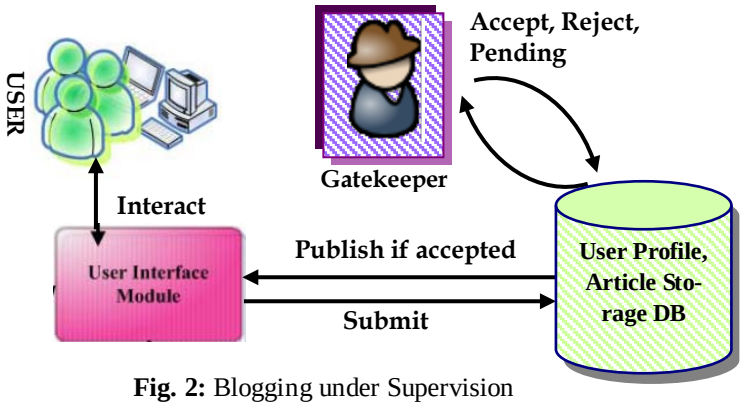

Fig. 2: Blogging under Supervision

3 Case Study

There are about 10 blogs in Bangladesh and most of them are developed for blogging in Bangla platform. The very first Bangla blog is somewhereinblog [5] which has around 40,000 registered accounts. About 10,000 bloggers visit, post, and interact on this site daily in average. At the beginning, this blog was open for everyone, i.e. anyone could register as a user and then could post his entries activating his/her account. Unfortunately, some bloggers abused this opportunity by posting offensive materials. Some of these posts were to spread ideology of some forbidden groups. On the other hand, some posts and comments were made to spread fake news intentionally. During mid November, 2009, this misuse had been occurred so frequently that the site administrator imposed some restrictions. Now, the user's entry does not immediately appear in the home page after registration. It is only shown at his personal page. The blog administrator will observe new bloggers' activities and he/she will get access to the home page after getting safe blogger notification from administrator. There is also a rating system for the bloggers which indicates whether the blogger is in safe state or not. However, this chaos in somewhereinblog compelled many users to leave the site and at the same time a new blogging platform developed named as 'sachalayatan' [6] which is known as 'online writers' community'. This forum does not provide post directly to the home page. Users have to write their entries as guests and the entries have to wait for the approval of the moderator. Each user has to post as guest for long time before getting access to write as a regular member. Both the two blogs are following a supervision process which requires human interaction. Sometimes this takes long time and users get bored in blogging to these sites. This finally leads to decreasing users' interest.

4 Blog-Post Supervision Process

We proposed an algorithm which will check the blog objects that are submitted to be published. Here, we used a dictionary database which has two types of words and also a list of links of restricted sites. First type is slang word list which will be used to measure frequency of these words in a blog-post. Another type is demand-based word list. Anytime, new words can be added to or deleted from this list.

Sometimes it is necessary to add some words which are not slang but required to control unusual events. For example, when a disaster (such as earthquake, firing etc.) or political violence (such as revolt in PilKhana) happens, then a number of blogs are posted immediately but most of them include wrong information about the incidents. These posts quickly spread rumor which may be harmful for the whole society. Demand base word list will help to protect the blogosphere from this type of chaotic situation.

4.1 Proposed Algorithm for Supervision

```
Procedure POST_SV ( Blog_Object)

[//Blog_Object may be Title, Post or Comments
 // Post or Comment includes body which may contain
    Texts, links of audio, video, documents or websites
//Organize Blog_Object data for search, i.e. links will be searched first
 ]

Do for each part of Blog_Object
While (True)
{
    //Continue till to end of selected module
    Integer frequency_level, check
   //Initialize frequency_level and check to zero

Select an Item from Blog_Object data
  IF (Item is link and found in list)
     Reject the post, send a notification and set check to 1
   ELSE IF (Item is found in demand-based list)
     Keep it pending for the administrator's approval and set
     check to 1
   ELSE
     {
       For each Item in Database
        {
  IF (Found)
          Calculate the overall frequency of the Items
  }// End_For
     } // End_ELSE

IF (check is not 1)
        IF (frequency_level > 60%)
        Reject the Post and send a notification
    ELSE IF (frequency_level is between 20-59%)
          Place it for moderator's approval
    ELSE IF (frequency_level is between 1-20%)
          Publish it and send a notification
    ELSE
        Just publish it
} // End_While
```

5 Conclusion

It is too hard to keep the blogosphere free from misuse. Only one way that can be done is check each and every part of the user generated contents. But it is totally contradictory of blog characteristics and also time consuming. Our proposed algorithm will play very effective role in this case. It will be very easy to find out the offensive posts and prohibit them from being post immediately. Though it is not possible to eliminate the current problem completely but still it will help to improve the chaotic situation of blogging world. We hope that it is possible to reduce about 60% of offensive posts from being post. However, one of the big problems is that in some cases some vulgar words may be used in a post for different purpose (for example, tutorials). And there is a chance that this algorithm will treat the post as suspected one. Another possibility is that a post with very few vulgar words may be published due to low frequency level. However, except these problems, we can say that the algorithm is efficient enough to find out unpleasant entries very quickly and to handle the anomalous situations in the blogosphere.

5.1 Futre Work

This algorithm can not check some of the posted or attached contents such as image or pdf files. It also cannot check the audio file contents for selecting a victim. There is scope to work in this area to improve the checking capability. Another property of the algorithm is that it is very simple. This can be improved using decision tree mechanism which will make a decision on the basis of the correlation of previous behavior of the user from the database and the frequency level. Finally, we did not implement the algorithm in real scenario. Hence, all the concepts are hypothetical. A good conclusion can be drawn after implementing the algorithm in practical field and analyzing the outcomes.

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Throughput Optimization in a Wireless Link Using AWGN and Rayleigh Channel

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Abstract: - In wireless communication throughput is a key factor to measure the quality of wireless data link. Throughput is defined as the number of information bits received without error per second and we would naturally like this quantity as to be high as possible. This thesis looks at the problem of optimizing throughput for a packet based wireless data transmission scheme from a general point of view. The purpose of this work is to show the very nature of throughput and how it can be maximized that means how we can optimize the throughput by observing its certain changing parameter such as transmission rate, packet length, signal-to-noise ratio (SNR) etc. I tried to take a more general look at throughput by considering its definition for a packet-based scheme and how it can be maximized based on the channel model being used.

Key words: Throughput, Optimization, AWGN, Rayleigh channel, Packet length, Transmission rate, Signal-to-Noise Ratio (SNR).

I. INTRODUCTION

Throughput is defined as the number of information bits received without error per second and we would naturally like this quantity as to be high as possible. In a wireless data system [1] many variables affect the throughput such as the packet size, the transmission rate, the number of overhead bits in each packet, the received signal power, the received noise power spectral density, the modulation technique, and the channel conditions. From these variables, we can calculate other important quantities such as the signal-to-noise ratio, the binary error rate, and the packet success rate. Throughput depends on all of these quantities.

Here I discuss the general look at throughput by considering its definition for a packet-based scheme and how it is maximized based on the channel model being used. As an initial step in a theoretical study, I examine the influence of transmission rate and packet size in a noise-limited transmission environment. The transmitter, operating at R b/s, sends data in packets. Each packet contains L bits including a payload of K bits and a cyclic redundancy check error-detecting code with C bits. A forward error correction encoder produces the remaining L-K-C bits in each packet. The channel adds white noise with power spectral density watts/Hz and the signal arrives at the receiver at a power level of P watts. In this research paper I assume to be the sum of all noise and interference, which can be modeled as Gaussian white noise. The CRC decoder detects transmission errors and generates acknowledgments that cause packets with errors to be retransmitted. Table 1 displays a summary of the variables in our analysis and their notation [2].

Quantity	Notation	Value
Signal to Noise Ratio	γ	10
Received signal power	P (watts)	$5*10^{-9}$ W
Receiver noise power spectral density	N0 (W/Hz)	10^{-15} W/Hz
Binary transmission rate	R bits/s	Varied
Packet size	L bits	Varied
Cyclic Redundancy Check	C bits	16 bits

Table 1: Variables in Analysis

An important objective of data communications systems design and operation is to match the transmission rate to the quality of the channel. A good channel supports a high data rate, and conversely. For a given channel, there is a transmission rate that maximizes throughput. At low rates, transmitted data arrives without error with high probability and an increase in the data rate increases throughput. Above the optimum rate, the error

probability is high and it is possible to increase throughput by decreasing the data rate, thereby increasing the probability of correct reception. Recognizing this fact, practical communications systems including facsimile, telephone modems, wireless local area networks, and cellular data systems incorporate rate adaptation to match the transmission rate to the quality of the channel. In some systems (facsimile and telephone modems), the adaptation is static, occurring at the beginning of a communication session only. In others, the adaptation is more dynamic with the rate rising and falling in response to changes in channel conditions.

The research work begins with the analysis by looking at throughput optimization as a function of the packet length with a fixed transmission rate followed by an analysis of throughput as a function of transmission rate with a fixed packet length. Using the optimization equations obtained, the throughput can be jointly optimized with respect to both the packet length and transmission rate, both written in terms of the SNR. These equations can be used to find the optimal signal-to-noise ratio (SNR) that the system should be operated at to achieve the maximum throughput. I have used these equations and simulated those in MATLAB and then observed the results in graphical representation in MATLAB window. I have talked about different variables and how changing certain parameters can yield better throughput performance.

II. THROUGHPUT ANALYSIS

A. Throughput Analysis

The amount of data transferred from one place to another or processed in a specified amount of time. Data transfer rates for disk drives and networks are measured in terms of throughput. Typically, throughputs are measured in kbps, Mbps and Gbps, the speed with which data can be transmitted from one device to another. Data rates are often measured in megabits (million bits) or megabytes (million bytes) per second. These are usually abbreviated as Mbps and MBps, respectively.

B. Assumptions and Definitions

My analysis includes the following simplifying assumptions: [2]

- The CRC decoder detects all errors in the output of the sending decoder channel. That means no matter what kind of data is transmitting and received by the receiving channel we are assuming that the receiving channel decoder will be able to get all the data most accurately. If there is any error in the bit stream then the CRC(Cyclic Redundancy Check) decoder will be able to correct all the errors in the received data.
- Transmission of acknowledgments from the receiver to the transmitter is error free and instantaneous.
- In the presence of errors, the system performs selective repeat ARQ (Adaptive Retransmission Query) retransmissions.
- The received signal power is P watts, either a constant or a random variable with a Rayleigh probability density function, representative of fading wireless channels. In this paper, we consider “fast fading” in which the values of P for the different bits in a packet are independent, identically distributed Rayleigh random variables.

System throughput (T) is the number of payload bits per second received correctly:

$$T = \frac{K}{L} R \ f(\gamma) \qquad (1)$$

where (KR/L) b/s is the payload transmission rate and f(□) is the packet success rate defined as the probability of receiving a packet correctly. This probability is a function of the signal-to-noise ratio

$$\gamma = \frac{E_b}{N_0} = \frac{P}{N_0 R} \qquad (2)$$

In which E_b = P/R joules is the received energy per bit. We will now look at maximizing the throughput in a Gaussian white noise channel with respect to the transmission rate and packet length.

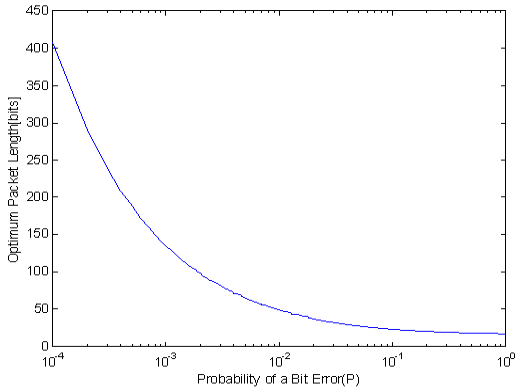

Figure 1: Optimum packet length as a function of P

III. SIMULATION AND RESULTS

A. Throughput vs. Transmission Rate: Fixed Packet Length

1. Equation simulation

To find the transmission rate, R=R* b/s, that maximizes the throughput, we differentiate Equation (1) with respect to R to obtain:

$$\frac{dT}{dR} = (K / L)\, f(\gamma) + (K / L)\, R \qquad (3)$$

$$\frac{df(\gamma)}{d\gamma}\frac{d\gamma}{dR} = (K / L)\left(f(\gamma) + R\frac{df(\gamma)}{d\gamma}(-P/N_0R^2) \right)$$

Next we set the derivative to zero:

$$f(\gamma) - (P / N_0R)\frac{df(\gamma)}{d\gamma} = f(\gamma)\gamma \qquad (4)$$

$$\frac{df(\gamma)}{d\gamma} = 0,$$

$$f(\gamma) = \gamma\frac{df(\gamma)}{d\gamma}. \qquad (5)$$

We adopt the notation $\gamma = \gamma^*$ for a signal-to-noise ratio that satisfies Equation (5). The corresponding transmission rate is

$$R^* = \frac{P}{\gamma^* N_0}. \qquad (6)$$

A sufficient condition for a locally maximum throughput at R=R* is:

$$\frac{d^2T}{dR^2}\Big|_{R=R^*} < 0 \qquad (7)$$

The solution to Equation (5), γ^*, is the key to maximizing the throughput of a packet data transmission. To operate with maximum throughput, the system should set the transmission rate to R* in Equation (6). γ^* is a property of the function, $f(\gamma)$, which is the relationship between packet success rate and signal to interference ratio. This function is a property of the transmission system including the modem, codecs, receiver structure and antennas. Each system has its own ideal signal-to-noise ratio, γ^*. Depending on the channel quality, reflected in the ratio P/N0, the optimum transmission rate is R* in Equation (6).

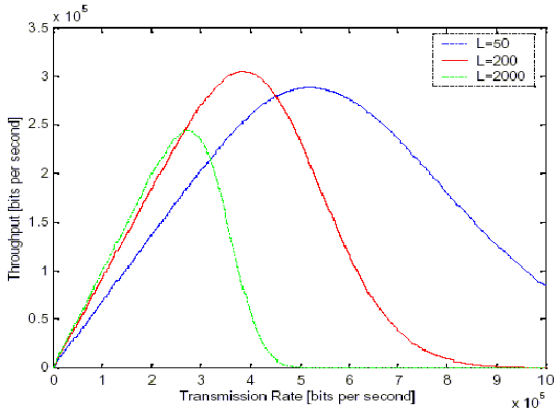

Figure 2: Throughput vs rate for fixed packet length

Graphical Analysis

In the figure 2 I have take three Readings. The first one was packet length of 50 bits. We have got the maximum throughput at transmission rate of 0.58 Mbps and the throughput was .27 Mbps. If we increase the transmission rate the throughput was seen to be fallen down and at a certain period it went to at the value zero. In my second assumption I have seen that for packet length of 200 bits the throughput was 0.30 Mbps and at the transmission rate of 0.4 Mbps it has gone its highest pick. After then it has also fallen down to zero. The third assumptions also showed the same. I have noticed that when the packet length size was small then the throughput has reached its highest pick with higher transmission rate and also has fallen in a wide range. But as soon as the packet length has kept higher then the curve of throughput is stepper rather than flat. When we have increased our packet length size then the throughput has reached the maximum pick at a lower transmission rate and also has fallen down quite quickly. So at the end we have come to some several decisions.

I have seen that if I keep my packet length less than 400 bits and greater than 50 bits, then I will be able to get the maximum throughput and the transmission rate shouldn't be so high. It has to be in a range of 0.3 Mbps to 0.8 mbps. So using the general equations for calculating throughput in respect of transmission rate and keeping the packet length fixed the throughput can be optimized in a certain range.

B. Throughput vs. Packet Length: Fixed Transmission Rate

Equation simulation

Each packet, of length L bits, is a combination of a payload (K bits) and overhead (L-K bits). Because the packet success rate, $f(\gamma)$ is a decreasing function of L, there is an optimum packet length, L*. When L<L*, excessive overhead in each packet limits the throughput. When L>L*, packet errors limit the throughput. When there is no forward error correction coding, which we shall assume for the entirety of this chapter, (K=L-C, where C bits is the length of the cyclic redundancy check), there is a simple derivation of L*. In this case,

$$f(\gamma) = (1 - P(\gamma)^{L}) \quad (8)$$

Where $P_e(\gamma)$ is the binary error rate of the modem. Therefore, in a system without FEC, the throughput as a function of L is

$$T = f(\gamma) = \frac{L-C}{C} R(1 - P_e(\gamma)^{L}) \quad (9)$$

To maximize T with respect to L, we consider L to be a continuous variable and differentiate Equation (9) to obtain

$$\frac{d}{d} = R\frac{L-C}{L\ L}(1-P_e(\gamma)^{L}) + \frac{C}{L^2}(1-P(\gamma)^{L}) \quad (10)$$

Setting the derivative equal to zero produces a quadratic equation in L with the positive root:

$$L^* = \frac{1}{2}C + \frac{1}{2}\sqrt{C^2 - \frac{4C}{\ln P_e(\gamma)}} \quad (11)$$

As shown in Figure 3, 4 and 5 (in which C=16), the optimum packet size is a decreasing function of $P_e(\gamma)$. As the binary error rate goes to zero, the packet error rate also approaches zero and the optimum packet size increases without bound. Because $P_e(\gamma)$ decreases with γ, L* increases monotonically with signal-to-noise ratio. Better channels support longer packets. Of course, in practice L is an integer and the optimum number of bits in a packet is either the greatest integer less than L* or the smallest integer greater than L*.

Equations (5) and (11) can be viewed as a pair of simultaneous equations in variables L and γ. Their simultaneous solution produces the jointly optimum packet size and Signal - to- noise ratio of a particular transmission system. We will use the notation, L** and γ**, respectively for the jointly optimized variables.

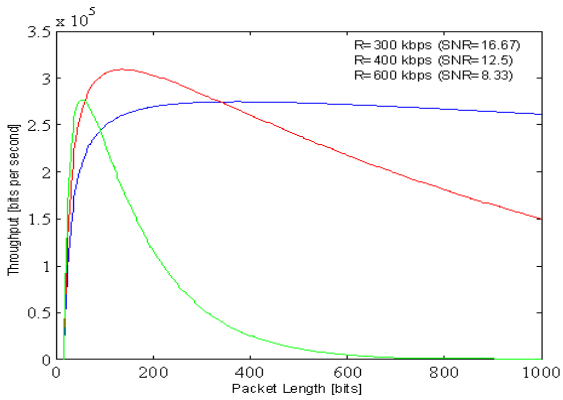

Figure 3: Throughput vs L for a fixed transmission rate (1)

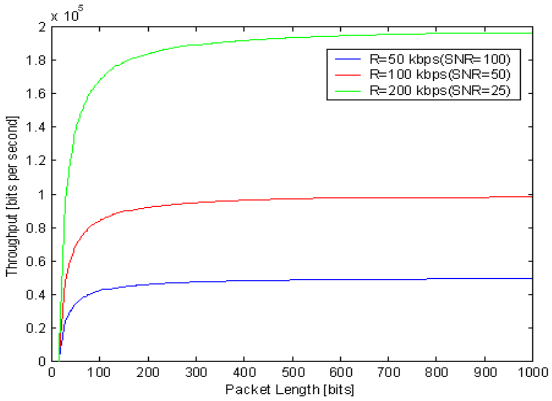

Figure 4: Throughput vs L for a fixed transmission rate (2)

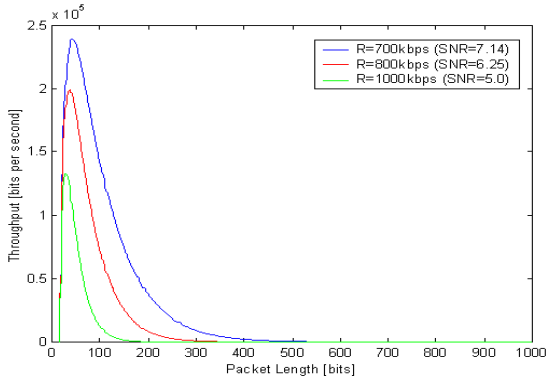

Figure 5: Throughput vs. L for a fixed transmission rate (3)

Graphical Analysis

Figure 3 shows and throughput optimization for fixed transmission rate varying the value of the packet length. I have taken three different assumptions for figure 3. In the first assumption I have taken the transmission rate as 300 kbps and for this value the SNR came as 16.67. I have got the value of SNR from the Equation 2. Where P (Received Signal Power) is Watts, (Received noise power spectral density) is W/Hz. Those values are constant here. In the second assumption I have taken the value of transmission rate as 400kbps and SNR as 12.5. In the third we have taken the transmission rate as 600kbps and SNR as 8.33. I have always kept the value of C (cyclic redundancy check) as 16bits.
Figure 4 shows the same work as 3. The only difference is I have changed the value of transmission rates. The first value is 50 kbps, SNR is 100. Second one is 100kbps, SNR is 50 and the third one is 200kbps, SNR is 25.

In the figure 5 we have increased the transmission rate like 700, 800 and 1000 kbps. From those rates I have got the value of SNR 7.14, 6.25 and 5.0 respectively. In every assumption I have also kept the value of C as 16bits as a constant.

One very important thing has also been observed. If I keep my transmission rate in the range of 0.2mbps to 0.4 mbps we will be able to get the maximum throughput. And for the maximum throughput the packet has come in the range of 200bits to 400 bits. So, this observation has proved my decision when I observed throughput in terms of transmission rate for certain fixed packet length. In this observation I have also seen that when I have taken the transmission rate higher than the throughput curve is going to be more stepper rather than flatter.

C. White Gaussian Noise Channel

The channel model is used to approximate the way errors are introduced in a data stream when it is transmitted over a noisy medium. The model we may use in the Workshop is the Additive White Gaussian Noise channel (AWGN). This channel [3] model is memory less, meaning that the distortion of one bit is independent of all other bits in the data stream. Here one noise is added with the original transmitted signal, called white noise.

The AWGN channel models the distortion incurred by transmission over a noisy medium as the addition of a zero-mean Gaussian random value to each bit. Decoders can take advantage of the added information of "how close" a received value is to a valid bit value (0 or 1 for our purposes). This type of decoding is called soft decision decoding. Because decoders that use soft decision decoding take advantage of information that the BSC throws away, soft decision decoders often have better error correcting capability.For the AWGN model, the parameters are noise variance values so they must be greater than or equal to 0

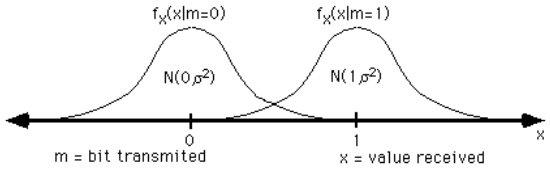

Figure 6: AWGN Channel

The design [4] of efficient signal sets for transmission over channels which are contaminated by Gaussian noise has been an active area of research for many years. Signal set that is more efficient than another will typically result in a comparable savings in transmitted energy. Hence the determination of optimal signal sets is an important problem from a practical communication perspective as well as from a theoretical standpoint. However, the optimal selection of signal vectors embedded in even the most fundamental type of noise, white Gaussian noise, is not known in general. In 1948, it was conjectured that, with finite energy constraints but without constraint on dimension of signal space, the M optimal signal vectors are vertices of a regular simplex in (M−1)-dimensional signal space. This conjecture is referred to as the strong simplex conjecture (SSC) when the signal vectors are constrained only by an average energy limitation and as the weak simplex conjecture (WSC when the signal vectors are equal-energy-constrained. Under assumption that signal vectors have

equal energy, Bal Krishnan proved that the regular simplex is optimal (in the sense of maximizing the detection probability) as λ goes to infinity, optimal as λ goes to zero, and locally optimal at all λ, where λ2 is the signal-to-noise ratio. Dun bridge proved further that under an average energy constraint the regular simplex is the optimal signal set as λ goes to infinity and a local ex temism at all λ. For the case of M=2 , the reg ular simplex has been proved to be optimal at all λ for both the average and equal energy constraint. Dun bridge proved, under an average energy constraint, that the regular simplex with M=3 is optimal as λ goes to zero. Work on the weak simplex conjecture in was shown by Farber in to prove this conjecture for M<5.

6.3 Equation Derivation

For non-coherent FSK in a white Gaussian noise channel, the probability of a bit error is given by:

$$P(\gamma) = \frac{1}{2} e^{\frac{\gamma}{2}} \qquad (12)$$

and so from (11) above, we can get the length to maximize the throughput by plugging in (12) for $P_e(\gamma)$. We illustrate how this graph changes with different values of R by showing three different plots on Figure 3. The solid line uses a transmission rate of 300 kbps (γ □= 16.67) which, from (11), yields a length of L*(16.67) = 373 bits to maximize the throughput. The small dotted line uses a transmission rate of 400 kbps (γ = 12.5) which yields a length of L*(12.5) = 137 bits to maximum the throughput. The large dotted line uses a transmission rate of 600 kbps (γ = 8.33) which yields a length of L*(8.33) = 54 bits to maximize the throughput. The relationship between the SNR, γ, and the transmission rate, R, is derived from (2).

Some important conclusions can be drawn from this information. We first notice that at high SNR values (low transmission rates) the packet length used to maximize the throughput must be large. When the transmission rate increases and the SNR drops, the packet length to maximize the throughput must also decrease. Another observation we make is how the throughput curve behaves for increasing values of L when different SNR values are used. From Figure 3 we can see that at high bit rates (low SNR) the choice of packet size is more critical (i.e. the peak is very localized). On the contrary, at low bit rates (high SNR) the packet length doesn't have much of an effect on the throughput. Also, it can be seen that the maximum throughput increases with decreasing SNR, up to a point. When the SNR gets too low, the maximum throughput begins to decrease. This suggests that the optimum SNR value to give the maximum throughput (γ**) is between 8.33 and 16.67. This observation is confirmed when the throughput is optimized jointly with both the packet length and the SNR.

From (5) we cannot obtain an explicit solution for the rate (or SNR) that optimizes throughput directly as was done for the length, but the following result is obtained:

$$e^{\frac{\gamma^*}{2}} = \frac{4}{2 + L\gamma^*} \qquad (13)$$

This solution results from substituting (8) for $f(\gamma)$ and (12) for $P_e(\gamma)$. For any value of L, there is a γ* that maximizes the throughput. To see the effects of varying the transmission rate we choose a fixed value of L and graph the throughput (9) as a function of R. To illustrate how this graph changes with different values of L we have shown three plots on Figure 4. The solid line uses a packet length of 50 bits. If we use this value of L in (13) we obtain as a solution γ* = 9.58, which from (6) corresponds to a rate of R* = 521.9 kbps to maximize the throughput. The small dotted line uses a packet length of 200 bits. If we use this value of L in (13) we obtain as a solution γ* = 12.95, or a rate of R* = 386.1 kbps to maximize the throughput. The large dotted line uses a packet length of 2000 bits. If we use this value of L in (13) we obtain as a solution γ^* = 18.24, or a rate of R* = 274.1 kbps to maximize the throughput.

We can see from Figure 4 that as the packet length increases the rate necessary to maximize the throughput decreases. Unlike Figure 4, however, the slope at which the throughput decays remains approximately constant for the different packet lengths. For rates less than the optimal rate, the throughput increases linearly with a slope of (LC)/ L. We can also make a general conclusion based on the shapes of the plots in Figures 3 and 4 by saying that the throughput is more sensitive to changes in the transmission rate than it is to changes in the packet length. Also, it can be seen that the maximum throughput achieved increases with increasing packet length, up to a point. If the packet length gets too large, then the maximum throughput begins to decrease. Based on the graphs in Figure 3, we can say that the optimum length to achieve the maximum throughput (L**) is somewhere between 50 and 2000 bits. This observation is confirmed

when we optimize the throughput with respect to both SNR and packet length.

To maximize the throughput with respect to both the packet length and the transmission rate, we can write the throughput solely as a function of the SNR by graphing (4.2) and substituting L* (4.4) for the length, and R* (3.4) for the rate. In Figures 3 through 5 we have assumed a constant value (5*106) for P/No. In reality, this value can change as a result of a number of different situations. P depends on the location of the mobile in relation to the base station and N0 depends on the level of interference present at the mobile. To illustrate how the throughput is affected by these different values of P/No we put three different plots in Figure 7. The solid line uses a value of 106, the small dotted line uses a value of 5*106, and the large dotted line uses a value of 107. A very important conclusion can be drawn from this. The actual value of P/No only determines the value of the maximum throughput. A high value of P/No indicates a high maximum throughput, and a low value indicates a low maximum throughput. The important thing to note from Figure 7 is that the value of the SNR to maximize the throughput is independent of the value of P/No. We can see that the SNR to maximize throughput for a Gaussian Channel is γ**=11.47. This is indicated by the vertical line in Figure 7. We can now use this value in (11) to find that the packet length to achieve maximum throughput is L** (γ**)=108 bits. This packet length is also independent of P/No

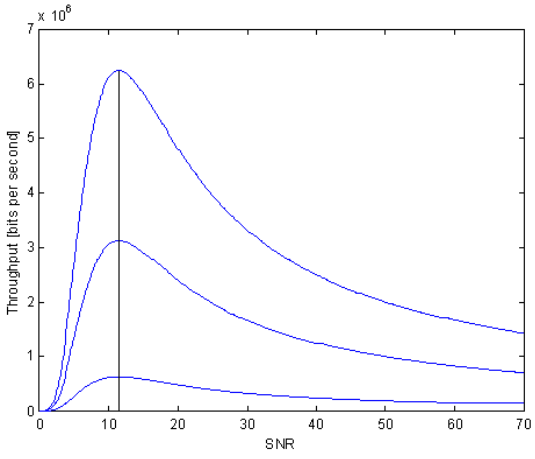

Figure 7: Throughput vs SNR using joint optimization (1)

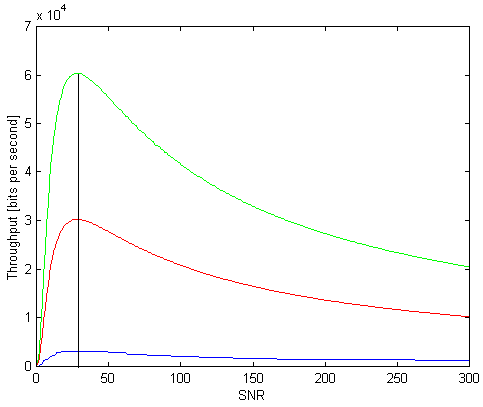

Figure 8: Throughput vs SNR using joint optimization (2)

6.4 Graphical analysis

Figure 7 and figure 8 has shown the throughput optimization with respect to joint optimization in terms of SNR(Signal to Noise Ratio) in White Gaussian Noise channel. We have analyze throughput with respect to SNR and has kept some fixes values for P/ N_0 . Here P is the received signal power and N_0 is the received noise power. In generalized form the value of P is $5*10^{-9}\,watts$ and the value of N_0 is 10^{-15} watts/Hz. So, the value of $\frac{P}{N_0}$ is $5*10^5$ Hz. In figure 6.1 we have taken three value of $\frac{P}{N_0}$, like 10^6, $5*10^6\,and\,10^7$. We have seen that for each assumption the throughput has reached in maximum peak in a certain term and then has fallen down. For different value each curve has reached its maximum peak in different level but there was one thing common. That was the value of SNR. In our Experiment we have seen that all the three curves has the maximum peak in the same value of SNR. Figure 7 has showed that with a vertical line between all the curves. Figure 8 was an extension of Figure 8. Here we have analyzed throughput with different value of $\frac{P}{N_0}$, and we have got the same result. So, we have come to the decision that in White Gaussian Noise Channel the joint optimization in terms of SNR has no impact on the throughput.

D. Rayleigh Fading Channel

For a model that corresponds to mobile radio communications, we can perform the same analysis for a

fast fading Rayleigh channel. For non-coherent FSK in a Rayleigh fading channel, the probability of a bit error is given by:

$$\overline{P_e}(G) = \frac{1}{2+G} \qquad (14)$$

We can see how a changing packet length affects the throughput by choosing a fixed transmission rate and graphing (4), with Pe(G) replacing Pe(□), as a function of the packet length. To illustrate the effects of changing the transmission rate on the throughput graph, we have three plots on Figure 6. The solid line uses a transmission rate of 10 kbps corresponding to G = 500 from (6) which from (11) yields a packet length of L*(500) = 98 bits to maximize the throughput. The small dotted line uses a transmission rate of 100 kbps corresponding to G = 50 which yields a packet length of L*(50) = 38 bits to maximize the throughput. The large dotted line uses a transmission rate of 500 kbps corresponding to G = 10 which yields a packet length of L*(10) = 24 bits to maximize the throughput. The same conclusions and observations can be made from Figure 6, 7 and 8 as those made from Figure 3, 4 and 5. The only real difference is the scale of the numbers used. Because a fading channel imposes more rigorous conditions on a transmission system, the achievable throughput will be lower than a Gaussian channel. Consequently, the system will have to operate at higher average SNR values and smaller average packet lengths.

From (9) the bit rate to maximize throughput is found to be:

$$R^* = \frac{P}{N_0}\left[\frac{L-3-\sqrt{L^2-6L+1}}{4}\right] \quad \ldots (15)$$

This solution results from substituting (11) for $\overline{f}(G)$ and (14) for $\overline{P_e}(G)$. To see how throughput changes as a function of the transmission rate we graph the throughput as a function of R with L fixed. To illustrate the effects of changing the packet length we have three plots on Figure 9. The solid line uses a packet length of 20 bits. We can use this value in (15) to tell us that the transmission rate to maximize the throughput is R* = 296.2 kbps (G* = 16.88). The small dotted line uses a packet length of 40 bits. From (15), the transmission rate to maximize throughput is R* = 135.3 kbps (G* = 36.95). The large dotted line uses a packet length of 100 bits. From (15), the transmission rate to maximize throughput is R* = 51.6 kbps (G* = 96.98). The same conclusions and observations can be made from Figure 12, 13 and 14 as those made from Figure 2, 3 and 4. Again, the only real difference is the numbers used. The transmission rate and throughput values are much smaller and the G values are much larger. An interesting result that follows from (13) is:

$$G^* = \frac{4}{L-3-\sqrt{L^2-6L+1}} = \frac{1}{2}(L-3+\sqrt{L^2-6L+1} \qquad (14)$$

This allows us to determine the value of the SNR to achieve maximum throughput for a given packet length in a Rayleigh fading channel.

To maximize the throughput with respect to both the packet length and transmission rate we can write the throughput as a function of SNR by using equation (9) and substituting L* (14) for the length, and R* (6) for the rate. The result is in Figure 13, 14. The same changes are made in P/No as were made in Figure 9 and 10 and the same conclusions can be drawn. The SNR value that maximizes throughput for a Rayleigh fading channel is G** = 28.12 and is independent of the value of P/No. This can be seen by the vertical line in Figure 13. We can now use this value in (11) to find that the packet length to achieve maximum throughput is L**(G**) = 31 bits. This value is also independent of P/No. The rate to maximize throughput R** is dependent on P/No from (6).

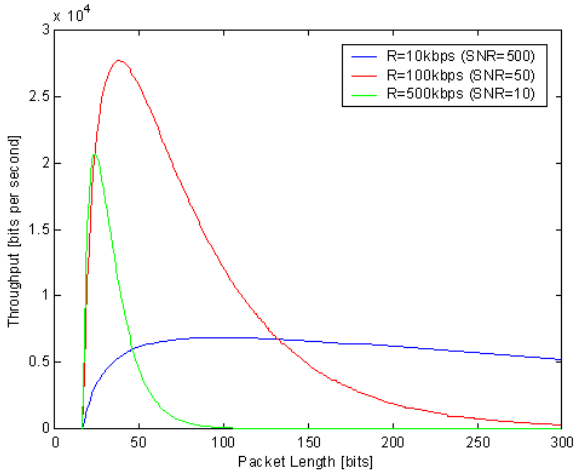

Figure 9:Throughput vs L for a Fixed Transmission Rate(Rayleigh Fading Channel) (1)

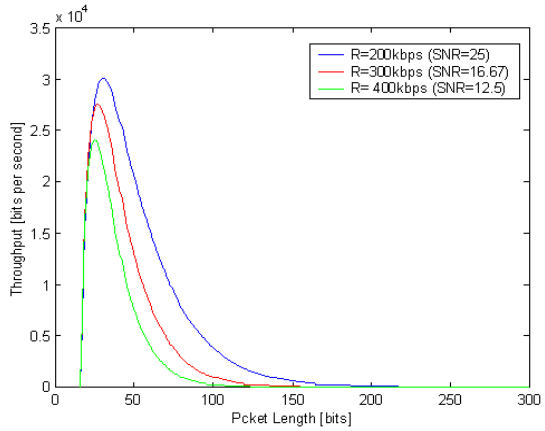

Figure 10: Throughput vs L for a Fixed Transmission Rate(Rayleigh Fading Channel) (2)

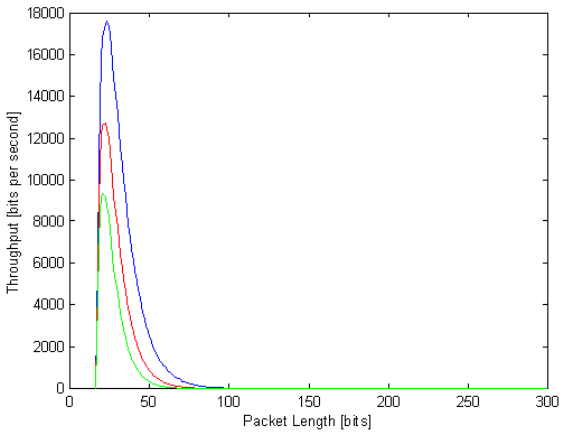

Figure 11: Throughput vs L for a Fixed Transmission Rate(Rayleigh Fading Channel) (3)

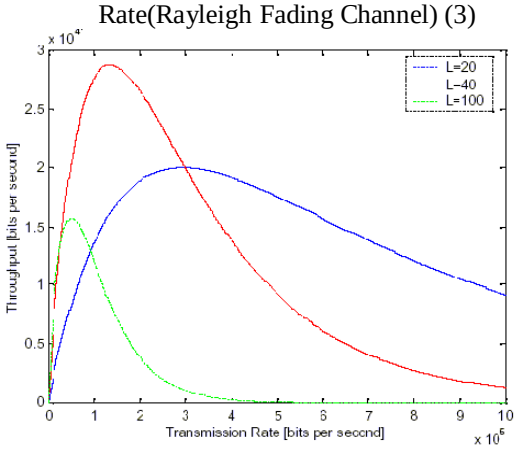

Figure 12: Throughput vs Rate for a Fixed Packet Length(Rayleigh Fading Channel)

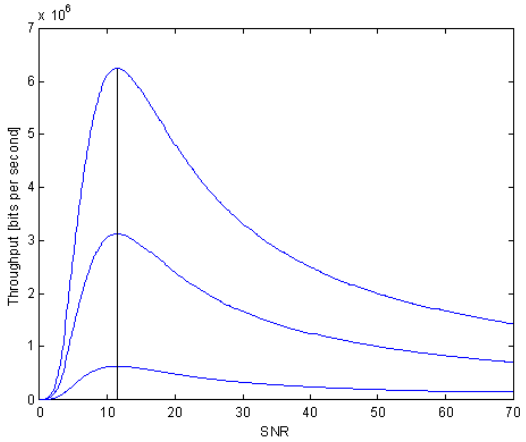

Figure 13: Throughput vs SNR Using Joint Optimization (Rayleigh Fading Channel) (1)

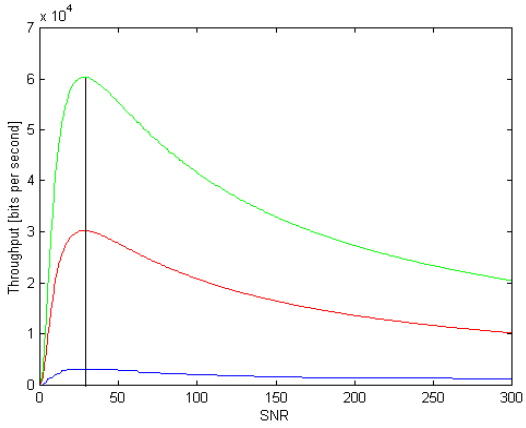

Figure 14: Throughput vs SNR Using Joint Optimization(Rayleigh Fading Channel) (2)

Graphical analysis

In rayleigh fading channel we have observed all the possibilities that we have done in the previous chapters. That means in this chapter we have analyzed throughput in terms of transmission rate keeping packet length fixed, packet length keeping the transmission rate fixed. Also in this chapter we have observed throughput in terms SNR using joint optimization under the Rayleigh fading channel.

Figure 9, 10 and 11 is the analysis of throughput in terms of packet length where the transmission rate is kept fixed. From those graphs we have observed that for transmission rate of 150 Kbps to 300 kbps we have got the maximum throughput of 300Kbps. If we go further, then the throughput has dropped toward zero.
Figure 12 is the representation of throughput with the function of transmission rate and fixed packet length. We have also observed that for transmission rate of 100 to

300 Kbps we have got the highest peak of throughput and the packet size was within 100 to 200 bits, which has matched with our previous observations.

Figure 13 and 14 has done with the throughput analysis in terms of SNR where we have used joint optimization. In our observations we have noticed that the throughput has no effect on the value of SNR in Rayleigh fading channel. For different assumption the throughput is different but the highest pick of each throughput is at the same value of SNR. In our observation we have got the value of SNR is 38 db.

IV. CONCLUSION

Maximizing throughput in a wireless channel is a very important aspect in the quality of a voice or data transmission. In this chapter, we have shown that factors such as the optimum packet length and optimum transmission rate are all functions of the signal to noise ratio. These equations can be used to find the optimum signal to noise ratio that the system should be operated at to achieve the maximum throughput. The key concept behind this research is that for each particular channel (AWGN or Rayleigh) and transmission scheme ( ), there exists a specific value for the signal to noise ratio to maximize the throughput. Once the probability of error, is known, this optimal SNR value can be obtained.

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Author Biography

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Seamless Information Flow in a Heterogeneous Networks using Mobility Management

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Abstract

In the heterogeneous networks, generally the entire networks operating on the Radio Frequencies under wireless mode available for communication are brought under a single head based on their common operating procedures and functions. As a common mode the basic functions of the networks are requesting, tracing, sending, acknowledging, authenticating, authorizing, receiving, updating, forwarding, controlling, registering, managing. As the radio frequency is considered the signal strength, maximum coverage, power level are taken as the major factor. Todays cellular network has a wide coverage area and also a good signal strength and as the WiMax is considered the data transmission rate and the volume of information communicated is high. As we consider the Adhoc Network the path tracing and the nearby node identification is faster and there is no need for a standard architecture. As the major of the different networks are combined with certain QoS without disturbing the existing infrastructure a fast seamless flow of voluminous information in real time application can be achieved. As the data transmission is considered the major part is affected based on the initiation & delay such as authentication delay, handover delay, session initiation, activation which is being carried out only after the control had reached the service point. In the proposed work the transmission of information is purely controlled by categorizing the type of information that is being transmitted such as the information ready for transmission is online or offline. Coming to on line either voice communication, Multimedia communication or real-time information transmission etc., Considering the offline the information is stored file or images etc,. Among the above one the real time video transmission is considered as the major application because delay cannot be permitted and one more thing the mobility should be managed without any break in the transmission path. The rapidly growing demand for "anywhere, anytime" high-speed access to IP-based services is becoming one of the major challenges for mobile networks. As the demand for mobility increases, mobile terminals need to roam freely across heterogeneous networks, posing the challenge of network integration into an All-IP ubiquitous access platform.

Keywords: Location Tracking, Location Management, Mobility Management, Heterogeneous Networks, Seamless services.

1. INTRODUCTION

Today's communication technology becomes outdated for tomorrows requirement. The growth of the ommunication industry is tremendous and unimaginable. There are different modes like "wired, wireless, adhoc, mobile etc., supporting the growth of the communication industry but with all certain limits. Now, it is time to emerge into the world of mobility where the wireless communication plays a vital role, where it is necessary to satisfy the requirements of the modern world. A world without a mobile phone is unimaginable. It has taken people to a different world. Now it is the time for providing services in an uninterrupted way. In medical industry a millisecond delay in transfer of information may lead to a loss of life. So the technology has to be updated day by day to meet the needs of the various industries. As the communication industry is considered it is one of the challenging one for the researchers. Considering the infrastructure of the existing communication industry a huge amount has been deployed by different service providers to satisfy their customer needs. It is now a challenge to provide the flow of information seamlessly without re-modifying the existing infrastructure. The most challenging one is to provide mobility management for

real time communication services. This paper mainly concentrates on framing a path in advance between the source and the destination based on the nature of the data being communicated in this case mobile video conferencing. This paper discusses the challenges involved in the mobility management between the source and the destination and handoff technique. In heterogeneous wireless networks, traditionally the network is initiated with any request and immediately the type of request is identified as voice, data, image, data and image, motion pictures, live information, online videos, store and forward etc,. Based on the type of information projected the network is chosen as if the transmission involves voice, voice and data, data and images the cellular network is chosen and if the transmission voluminous data and image transmission and the network coverage is short, the wifi or WLAN network is chosen. If the the transmission involves live videos with emergency information an open connection between the transmitter and the receiver is proposed. As an example the following situation is considered. In case of emergency situation such as natural calamities and disaster – which require immediate recovery and attention by identifying the spot and also requires emergency medical help, where it is not possible to make the medical experts present for helping hand in person, a virtual communication media can be set up and the experts from remote areas can bring closer and the condition of the patient can also viewed by the medical experts so that they can provide a good medical treatment with the available practitioners. So that the invaluable life can be saved. This is the major purpose for choosing the research topic. Considering the handoff it is mainly classified as: horizontal handoff and vertical handoff. A horizontal handoff is made between different access points within the same link-layer technology such as when transferring a connection from one Base Station to another or from one Access Point to another. A vertical handoff is a handoff between access networks with different link-layer technologies, which will involve the transfer of a connection between a Base Station and an Access Point. Seamless and efficient Vertical Handoff between different access technologies is an essential and challenging problem in the development toward the next-generation wireless networks [1][12]. Internally as the handoff process is considered it can be further carried out using the following main steps: system discovery, handoff decision, and handoff execution [24]. During the system discovery phase, mobile terminals equipped with multiple interfaces have to determine which networks can be used and the services available in each network. During the handoff decision phase, the mobile device determines which network it should connect to. During the handoff execution phase, connections need to be rerouted from the existing network to the new network in a seamless manner. There are three strategies for handoff decision mechanisms: mobile-controlled handoff, network-controlled handoff, and mobile-assisted handoff [14]. Mobile Controlled Handoff is used in IEEE 802.11 WLAN networks, where a Mobile Host continuously monitors the signal of an Access Point and initiates the handoff procedure. Network Controlled Handoff is used in cellular voice networks where the decision mechanism of handoff control is located in a network entity. Mobile Assisted Handoff has been widely adopted in the current WWANs such as GPRS, where the mobile host measures the signal of surrounding base stations and the network then employs this information and decides whether or not to trigger handoff [3][13]. The handoff algorithms[3] considered are based on the threshold comparison of one or more metrics and dynamic programming/artificial intelligent techniques applied to improve the accuracy of the handoff procedure. The most common metrics are received signal strength, carrier-to-interference ratio, signal-to-interference ratio, and bit error rate [2]. In heterogeneous wireless networks, even though the functionalities of access networks are different, all the networks use a specific signal beacon or reference channel with a constant transmit power to enable received signal strength measurements. Thus, it is very natural and reasonable for vertical handoff algorithms to use received signal strength as the basic criterion for handoff decisions [14] [16].

The rest of the paper is organized as follows: Section II provides the survey of existing technologies. Section III provides the solution for mobility management. Section IV presents the proposed method. Section V presents the results and related discussion. Section VI discusses directions for future work and concludes this paper.

2. SURVEY OF EXISTING TECHNOLOGIES & METHODS

In the real-time service, the number of continuous beacon signals should be lower than that of the non-real-time service in order to reduce the handoff delay [26][30]. More parameters may be employed to make more intelligent decisions. Li et al. [10] propose a bandwidth aware VHO technique which considers the residual bandwidth of a WLAN in addition to RSS as

the criterion for handoff decisions. However, it relies on the QBSS load defined in the IEEE 802.11e Standard to estimate the residual bandwidth in the WLAN. In [29], Weishen et al. propose a method for defining the handoff cost as a function of the available bandwidth and monetary cost. In[16], actual RSS and bandwidth were chosen as two important parameters for the Waveform design. Hossain et al. [15] propose a game theoretic frame work for radio resource management perform VHO in heterogeneous wireless networks. One main difficulty of the cost approach is its dependence on some parameters that are difficult to estimate, especially in large cellular networks. Mohanty and Akyildiz [14] developed a cross-layer (Layer 2 + 3) handoff management protocol CHMP, which calculates a dynamic value of the RSS threshold for handoff initiation by estimating MH's speed and predicting the handoff signaling delay of possible handoffs.

To sum up, the application scenario of current Vertical Handoff algorithms is relatively simple. For example, most Vertical Handoff algorithms only consider the pure Vertical Handoff scenario, where the algorithm only needs to decide when to use a 3G network and when to use a WLAN [1], [10], [17], [18], [21], [25]. In fact, at any moment, there may be many available networks (homogeneous or heterogeneous), and the Handoff algorithm has to select the optimal network for Horizontal Handoff or Vertical Handoff from all the available candidates. For example, if the current access network of Mobile Host is a WLAN, the Mobile Assisted Handoff may sense many other WLANs and a 3G network at a particular moment, and it has to decide whether to trigger Horizontal Handoff or Vertical Handoff. If the Horizontal Handoff trigger is selected, Mobile assisted handoff then needs to decide which WLAN is the optimal one [20] [22]. Consequently, an analytical framework to evaluate VHO algorithms is needed to provide guidelines for optimization of handoff in heterogeneous wireless networks. It is also necessary to build reasonable and typical simulation models to evaluate the performance of VHO algorithms. The proposed work will provide an optimal solution to choose the network based on the type of service that is being carried out. As the work mainly concentrates on the application oriented approach the type of network and handover selection is also based on requirement It also concentrates on the identification of the source and destination and by locating them the path is chosen.

3. SOLUTIONS FOR MOBILITY MANAGEMENT

As today's requirement mainly focuses on voluminous information in real time which includes audio and video files where the continuity in the transmission path has to be maintained to give a seamless flow of information. Therefore, to provide a seamless flow of information in the heterogeneous environment, Mobility Management is considered as a major role. In the proposed work a generic tree is dynamically created from the geographical map generated between the source and the destination and also updations are made quite in advance so that as the device in mobility crosses the network the controls are just being communicated and processed in the background and the real communication takes place without any interruption.

As the metrics for mobility initially the status of the PDA (Mobility device) is being identified:

i. Source stable Destination dynamic
ii. Source dynamic Destination stable
iii. Source dynamic Destination dynamic
iv. Source stable Destination stable

Note: The dynamic speed for the PDA is considered as the vehicular speed (250Kms/Hr)

I. Location Tracking

In this section, two classes that solve the all-pairs shortest-paths problem is being considered as a base. The first method is to run Dijkstra's algorithm from each vertex to get the shortest paths from that vertex to each of the others. If the priority queue with a heap is implemented, the worst-case running time for this approach is proportional to $VE \lg V$, and can improve this bound to VE for many types of networks by using a d-ary heap. The second method, which allows to solve the problem directly in time proportional to V^3, is an extension of Warshall's algorithm that is known as *Floyd's algorithm*. The goal of the algorithms in this section is to support constant-time implementations of the query methods. Both of the algorithms that we consider use space proportional to V^2 for the private data fields. The primary disadvantage of the general approach for a huge network is overcome by generating the graph dynamically by fixing the boundary of the source and the destination.

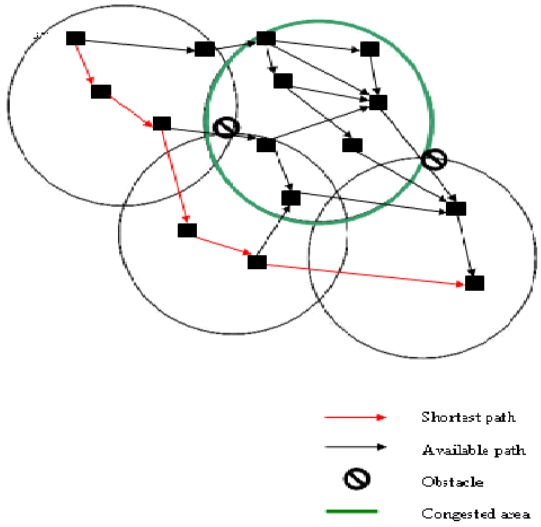

Fig 1. Location tracking using the all pair shortest path algorithm.

In this case the fourth state is considered as the source stable and destination stable and the shortest path is identified based on the signal strength and also the feasibility with minimum handover.

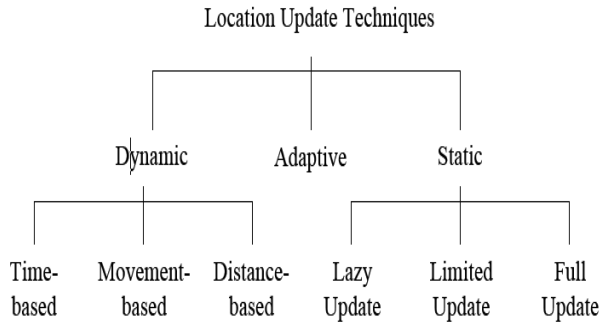

Fig.2 Traditional location updating architecture

A. All-pairs shortest-paths by fixing the boundaries

The solutions to the all-pairs shortest-paths problem are all classes with a constructor and two query methods: a `dist` method that returns the length of the shortest path from the first given vertex to the second; and one of two possible path methods, either `path`, which returns a reference to the first edge on the shortest path, or `pathR`, which returns a reference to the final edge on the shortest path. If there is no such path, the path method returns `0` and `dist` is undefined. We use `path` or `pathR` as convenient for the algorithm under scrutiny; in practice, we might need to settle upon one or the other (or both) in the interface and use various transfer functions in implementations.

```
class GraphS //
{ // implementations and private members hidden
  GraphS(GRAPH G)
  Edge path(int, int)
  Edge pathR(int, int)
  double dist(int, int)
}
```

The first all-pairs shortest-paths ADT method implementation that we consider solves the problem by using Dijkstra's algorithm to solve the single-source problem for each vertex. We build an array of `GraphSPT` objects, one to solve the single-source problem for each vertex. This method generalizes the BFS-based method for unweighted undirected graphs. It is also similar to our use of a DFS that starts at each vertex to compute the transitive closure of unweighted digraphs.

B. Computing the diameter of a network

This client illustrates the use of the interface in It finds the longest of the shortest paths in the given network, prints the path, and returns its weight (the diameter of the network).

```
static double diameter(Graph G)
{ int vmax = 0, wmax = 0;
  GraphS all = new GraphS(G);
  for (int v = 0; v < G.V(); v++)
    for (int w = 0; w < G.V(); w++)
      if (all.path(v, w) != null)
        if (all.dist(v, w) > all.dist(vmax, wmax))
          { vmax = v; wmax = w; }
  int v = vmax; Out.print(v + "");
  while (v != wmax)
  { v = all.path(v, wmax).w(); Out.print("-" + v); }
  return all.dist(vmax, wmax);
}
```

With Dijkstra's algorithm, we can find all shortest paths in a network that has nonnegative weights in time proportional to $VE \log_d V$, where $d = 2$ if $E < 2V$, and $d = E/V$ otherwise. For dense graphs, we could use an adjacency-matrix representation and avoid computing the reverse graph by implicitly transposing the matrix (interchanging the row and column indices), Developing an implementation along these lines is an interesting programming exercise and leads to a compact implementation; however, a different approach, which we consider next, admits an even more compact implementation.

C. Algorithm for all shortest paths for Dynamic Source

This class uses Dijkstra's algorithm to build an SPT for each vertex so that it can answer `pathR` and `dist` queries for any pair of vertices.

```
class GraphS
{ private GraphSPT[] A;
  GraphSl(Graph G)
   {
    A = new GraphSPT[G.V()];
    for (int v = 0; v < G.V(); v++)
      A[v] = new GraphSPT(G, v);
   }
  Edge pathR(int s, int t)
   { return A[s].pathR(t); }
  double dist(int s, int t)
   { return A[s].dist(t); }
}
```

The method of choice for solving the all-pairs shortest-paths problem in dense graphs, was same as previous method, except that instead of using the logical *or* operation to keep track of the existence of paths, it checks distances for each edge to determine whether that edge is part of a new shorter path.

D. Algorithm for all shortest paths for Dynamic Source and Destination

After initializing the distances and paths matrices with the graph's edges, we do a series of relaxation operations to compute the shortest paths. The algorithm is simple to implement, but verifying that it computes the shortest paths is more complicated.

```
class GraphS
{ private Edge[][] p;
  private double[][] d;
  GraphSl(Graph G)
   { int V = G.V();
     p = new Edge[V][V]; d = new double[V][V];
     for (int s = 0; s < V; s++)
       for (int t = 0; t < V; t++)
         d[s][t] = maxWT;
     for (int s = 0; s < V; s++)
       for (int t = 0; t < V; t++)
         if (G.edge(s, t) != null)
           { p[s][t] = G.edge(s, t);
             d[s][t] = G.edge(s, t).wt(); }
     for (int s = 0; s < V; s++) d[s][s] = 0.0;
     for (int i = 0; i < V; i++)
       for (int s = 0; s < V; s++)
         if (p[s][i] != null)
           for (int t = 0; t < V; t++)
             if (s != t)
              if (d[s][t] > d[s][i] + d[i][t])
               { p[s][t] = p[s][i];
                 d[s][t] = d[s][i] + d[i][t]; }  }
  Edge path(int s, int t)
   { return p[s][t]; }
  double dist(int s, int t)
   { return d[s][t]; } }
```

With this algorithm, we can find all shortest paths in a network in time proportional to V^3.

Proof: The running time is immediate from inspection of the code. The `i`th iteration of the loop computes a shortest path from `s` to `t` in the network that does not include any vertices with indices greater than `i` (except possibly the endpoints `s` and `t`). Assuming this fact to be true for the `i`th iteration of the loop, we prove it to be true for the (`i+1`)st iteration of the loop. A shortest path from `s` to `t` that does not include any vertices with indices greater than `i+1` is either (*i*) a path from `s` to `t` that does not include any vertices with indices greater than `i`, of length `d[s][t]`, that was found on a previous iteration of the loop, by the inductive hypothesis; or (*ii*) comprising a path from `s` to `i` and a path from `i` to `t`, neither of which includes any vertices with indices greater than `i`, in which case the inner loop sets `d[s][t]`. An entry in the distance matrix has the length of the shortest known path connecting the vertices corresponding to the given row and column; the corresponding entry in the paths matrix gives the next vertex on that path.

II. Session Management

The session management protocol (SMP) lies in the application layer and the major work is to identify the required resources based on the type of data/ information that has to be transmitted / shared. Generally the data/ information can be categorized based on their application and the usage. The different types of information types are given in fig. 4. Based on the application of the data/ information the session management protocol is activated and the type of network is also selected. If the application involves huge data transmission then the bandwidth is shared and the network is chosen appropriately. The main goal is to provide a seamless flow of information without connectivity failure as the terminals are in mobile.

To support IP QoS, the Internet Engineering Task Force (IETF) recommends integrated services (IntServ) and

differentiated services (DiffServ) [8]. These services also are expected to be effective in all-IP-based 4G networks. Since 4G networks will support multimedia traffic, we must visit the issue of providing IP QoS in IP based wireless access networks[8] and propose ITRAS for QoS support in 4G networks, where the decision of radio resource allocation follows IntServ or DiffServ policy.

IntServ uses Resource Reservation Protocol (RSVP) to reserve bandwidth during the session setup. As a first step in RSVP, the source sends a QoS request message of PATH to the receiver through intermediate routers that run an admission and a policy control. If the sender receives RESV returned from the receiver through the reverse route as an indication of QoS guarantee, it initiates the session. If each router along the path receives packets, it classifies and schedules them. IntServ ensures strict QoS, but each router must implement RSVP and maintain per-flow state, which can cause difficulties in a large-scale network. DiffServ, on the other hand, does not require a signaling protocol and cooperation among nodes. As the QoS level of a packet is indicated by the DS field of IP header (TOS (type of service) field in IPv4, Traffic Class field in IPv6), each domain can deal with it independently. After the packet is classified, each router can mark, shape, or drop it according to network status. Since DiffServ is not so rigorous as IntServ, it is scalable in supporting QoS statistically.

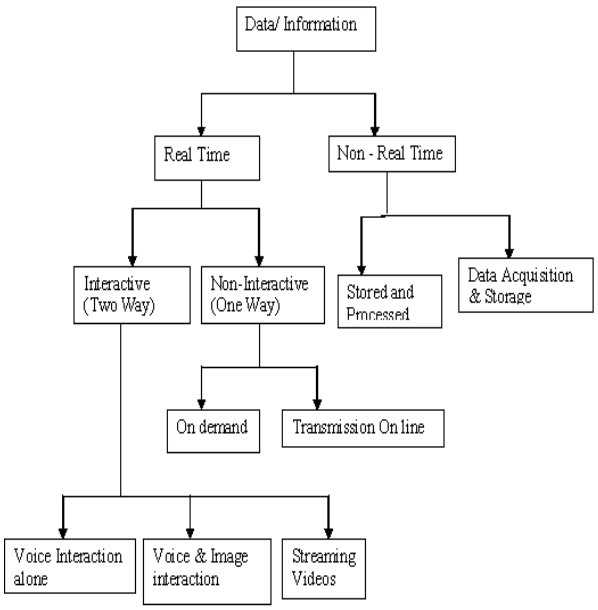

Fig.3. Information Classification

4. PROPOSED SERVICE METHOD

Given the requirements for seamless mobility listed above, the roles to be supported by a mobility management function exploiting the terminal capability to access several radio access networks are the following:

i. Selection of the access network at application launch. This role is ensured by mobility management subfunctions here referred to as *service-to-radio mapping control*.

ii. Triggering of the handover during a session. The mobility management function aims at always providing the best access network to the terminal.

iii. A terminal-centric selection without network assistance or recommendation

iv. A network-controlled selection within network entities, based on both terminal and access network measurements, enforcing decisions on the terminal

v. Network-assisted selection on the terminal side, the network providing operator policies, and access/core load information (joint terminal/network decisions). When only one access remains available, network-assisted selection is applied; when access selection is triggered by network load considerations, network control may be used for load balancing.

vi. Finally, for access network selection, the mobility management function must retrieve the status of resource usage in each access network. This information is provided by an "access network resource management" function, which computes a technology-independent abstracted view of access resource availability.

Functional Entities Involved in Mobility Management

The mobility management functions are supported by functional entities described below that are responsible for selecting the best access network for each terminal. They may be triggered at application launch or during the time of connection establishment.

- Generate a geographical map between the source and the destination based on the mode of transport
- Tabulate the list of service providers with their frequency and coverage
- Create an acyclic graph by pointing out the service providers and the geographical scenarios
- Form a topological graph from the acyclic graph by removing the obstacles and considering the signal strength
- Get the traffic status of each and every link from source to destination
- Now create a path from source to destination based on

the network traffic and also by choosing the shortest path with minimum handovers

- For all the network in the specified path between the source and destination
  - Get the bandwidth of the network
  - Calculate the average traffic of the network
  - Note down the obstacles on the way
  - Note down the active service providers with their coverage area
  - Note down the type of network services [3G, 3GPP]
- Calculate the traffic density in the in the network
  NLc + ΔE ≤ NLth → take the same path
  NLc → Current Network Load
  ΔE → Estimated Increase in Load
  NLth → Network Threshold Load
- Generate a shortest path based on
  - The maximum signal coverage
  - Traffic density below the NLth
- Continue the transmission in the specified path
- Continue the same procedure till the source reaches the destination or the source is stable or not in mobility

Assumptions made for the analysis

Atleast one type of service provider is available within the limit

5. RESULTS AND DISCUSSION

The following section is to provide the seamless flow of information in a practical context that addresses the integrating of cellular and WLAN access networks. In order to implement the different functions listed earlier, some initial technological choices need to be made. First, only intertechnology handoffs WLAN are considered in the seamless mobility architecture. Intratechnology handoffs are taken care of by technology-specific mechanisms. Then Mobile IP has been chosen as the L3 protocol for handoff execution in the proof of concept, and is used on top of either IPv4 or IPv6 in order to provide session continuity during intertechnology handoff. A clear separation of handoff decision and execution processes allows any evolution of IP protocols to minimize new care-of address configuration and rerouting latencies, for instance, to replace baseline Mobile IP without modifying the proposed architecture.

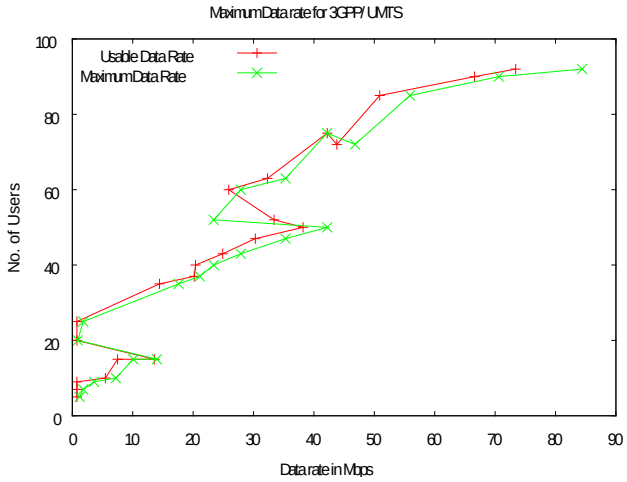

Fig.4. Data rate of the Network 3GPP/ UMTS

AS the existing technology is considered the 3GPP/ UMTS network has a constant coverage for a limited traffic. The maximum users allowed is 80 – 85. Also as the usage spectrum is considered only 80 – 85% of the available spectrum is utilized efficiently. The result is shown in fig. 4. During which no traffic can be transmitted or received (it corresponds to traffic interruptions on Fig. 4. Upon returning to normal operation, a peak of traffic is observed when the terminal transmitting a burst of packets that could not be transmitted during the scanning periods of 200–400 ms. In order to avoid perceivable interruption of voice transmission, an adaptive buffer has been set up on the receiver side, which enables the network to cope with "silences" but results in slightly increased latency. This configuration could further be improved by breaking the scanning period into shorter ones in order to avoid latency increase. However, this configuration may lead to lower measurement precision, so an acceptable compromise must be reached. In any case, this scenario is not considered for wider-scale deployment, since the latency on the EDGE network leads to unacceptable VoIP quality.

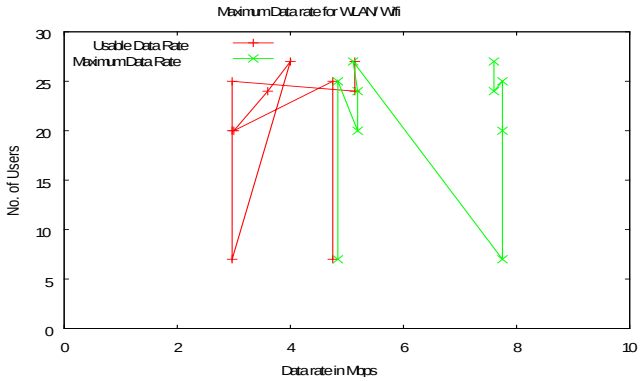

Fig. 5. Data Rate of WLAN Network

Another goal of the test bed was to assess performance of mobility management in the WLAN environment. As an example, we considered handoff delay for a 60 kb/s Real-Time Transmission Protocol streaming service, with handoff delay defined as the delay between the first Real-Time Transmission Protocol packet on the new interface and the last packet on the old interface. When network control is enabled, the decision to perform handover is taken on load criteria: the streaming starts on the WLAN interface where other terminals load the AP when the network load reaches a given threshold, mobility management entities trigger the handover. In both cases handoff delay was about 0.05 ms, because of Mobile IP and Generic Packet Radio Service network latencies. The results of the data rate in fig. 5 also gives a clear picture that it was mainly based on the nature of the application and also the stability of the network varies upon the nature of the functions of the hardware deployed.

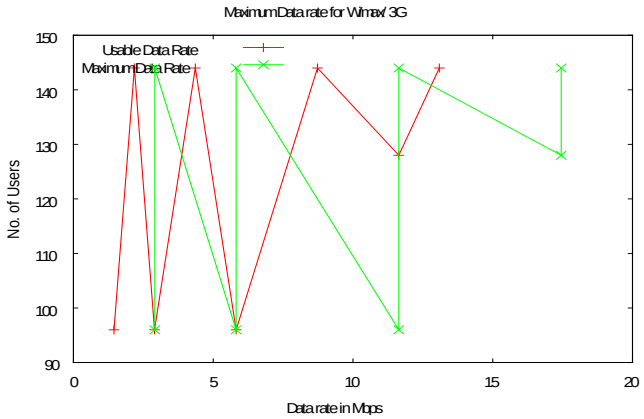

Fig6. Data Rate in the 3G Environment

The higher transmission latency experienced in the cellular access network can be observed in the graph provided (fig. 6). On the transmit side, the transmission is performed with no silence period. On the receive side, handing over to the cellular network introduces more latency, results in a silence period the order of magnitude of which is equal to the latency difference between both networks. The use of an adaptive buffer at the receiver side makes it transparent to the user which is reflected as a smooth seamless flow in the heterogeneous Networks. When considering the 3G/ Wimax cellular network, the number of users is high compared with the other networks and also had a wider coverage but there is a pitfall at the end, the bandwidth fluctuates beyond 80%. At the time of mobility the network coverage is limited as shown in fig. 6

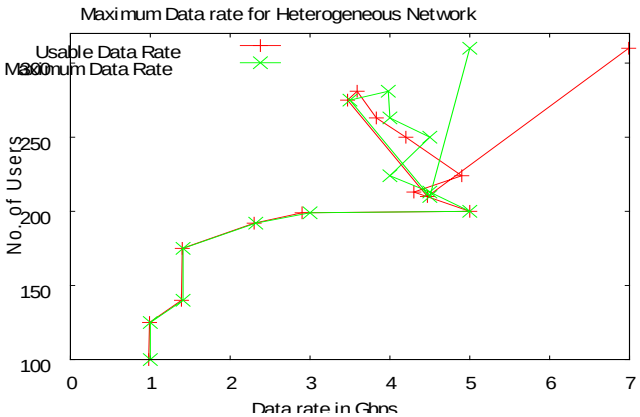

Fig.7. Data Rate in the Heterogeneous Network Environment

By considering the positive measures of the above mentioned networks and by having a thorough understanding between the available networks the heterogeneous network is designed. The heterogeneous network provides maximum throughput, minimum number of handoffs and maximum coverage at mobile. By designing a proper QoS standard and having proper understanding between the network the desires which are explained at the initial paragraph can be achieved. By improving the performance measures by deploying and allocating the code cpectrum for the 3GPP network and by having proper power management in the 3G network and by making use of antennas with wider coverage in WLAN environment, the available bandwidth can be maximum utilized and also the number of handoffs can be reduced as the nature of the network present in the graphical architecture between the source and the destination is studied in advance, a maximum throughput can be achieved with minimum tolerable delay or no delay based on the nature of the information that is taken for transmission. The data rate of the heterogeneous network is very close to the available rate as shown in fig. 7.

6. FUTURE SCOPE & CONCLUSION

Results have confirmed the feasibility of the approach;

its scalability to large geographical areas has to be confirmed with additional validation through simulations and trials. A possible stepwise approach to the deployment of the different functional elements of the presented architecture is defined. In this approach a vector based location tracking and management is only considered for the seamless flow. By combining the parameters such as signal strength and delay management in flow and also the formats of the information we can have a seamless flow. Also the QoS between the Radio Access Networks's should be standardized in such a way that there is no mismatch of transmission from one type of environment to another type. Finally, with the advent of research on moving networks (e.g., Network Mobility), in which the whole network is mobile, the integration of WLANs and WMANs can improve mobile network connectivity. It is expected that public transportation (trains, buses, airplanes, ships, etc.) will popularize Internet access through WiFi connectivity to passengers while in movement. To this end, it will be equipped with a bridge to communicate with external networks such as WiMAX. Moreover, seamless mobility is still an issue as clients may be equipped with both interfaces, and the vehicle gateway may also give support to WiFi external connectivity through dual gateways /interfaces (WiFi/ WiMAX) in order to offer fault tolerance and load balance between networks as well as new connectivity opportunities to passengers. Apart from serving the movement network, the mobile gateway can also be used by external clients, such as those outside the WiFi AP and WiMAX BS coverage areas, but that have the opportunity to download data or attain Internet access through the dual gateway belonging to the vehicular area network (VAN).

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Security Enhancement by using Video Surveillance System

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Abstract

Video surveillance system, also called Visual monitoring and security system has been a key component in ensuring security at airports, bands, casinos and correctional institution and also used for military application and wild life preserve management. In this paper we have implemented a method for human detection by using edge detection [3] and segmentation methods[9][3] and human tracking[4][3] is done by using feature tracking method. Kanade-Lucas-Tomasi[10] proposed an effective algorithm for human tracking.Using this method a significant performance can be obtained in a surveillance system.In this paper he proposes an algorithm and stepwise result. We implemented this algorithm in C. We assume that the motion of a human is normal (approx. 7km/hr).According to our implementation and results we found that our system is more accurate and efficient as compared to the previous work.

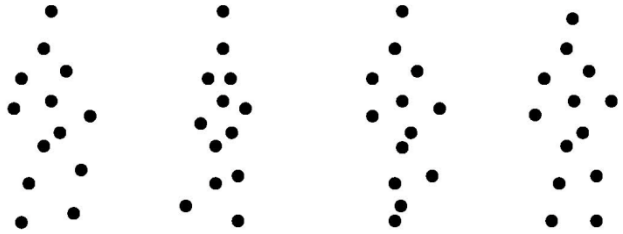
***Keywords*:** Video Surveillance, Edge detection, Segmentation, Feature tracking.

1. INTRODUCTION:

Video Surveillance system is also referred to as visual monitoring and security system. With the increasing population there has been a proportionate growth in the number of public places. It is, thus, essential to provide a secured and safe environment at such places. A proper security mechanism must be in place so as to prevent possible terror attacks, thefts or other abuses. More recently government agencies, schools and businesses are turning towards visual monitoring and security systems as a mean to increase public security. These systems are used for ensuring security and law enforcement. Visual monitoring and security system has been a key component in ensuring security at airports, bands, casinos and correctional institution and also used for military application and wild life preserve management. The Video Surveillance System tracks individual pedestrians as they pass through the field of vision of the camera, and uses vision algorithms to classify the motion and activities of each pedestrian. With this information, the system can bring the incident to the attention of human security personnel. The system requires people to be tracked. Information about their behaviors can be obtained from their trajectories and interaction between them.

Detection of a human based only on motion may, at first, seem far-fetched. Do the motion of the limbs contain enough information to infer the presence of a human? Experiments performed by Johansson[4] in the 1970's demonstrated the answer to be 'Yes'. Johansson filmed moving humans in a pitch-black room, the only visual indicator being a white point of light attached to each limb. He showed that a viewer watching the film could easily identify human motion, despite the absence of visual cues such as shape, texture, brightness, and color. An example of these Johansson points is shown in the Figure below. Given that the human brain can effortlessly recognize this motion, it is conceivable that a computer algorithm could do the same.

In addition, single points of motion as used in the Johansson experiment can be efficiently represented on a computer. Unlike pure image processing, which must deal with large numbers of pixels at each time step, this Johansson motion can be specified by a handful of points, each represented by a 2-D position and a 2-D velocity at any given time. This gives us hope that a simple, effective algorithm is achievable.

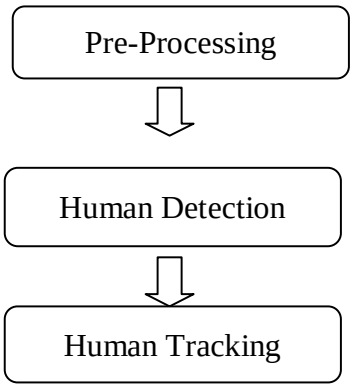


An example sequence of Johansson points above show the side view of a walking human. Taken one image at a time, the shape of the human figure is not completely apparent. However, when considered in sequence, the images clearly depict a human.

The Johansson experiment shows us that human detection from the motion of point features is a realistic goal. With this premise in mind, we can divide the system into several sub problems:

1. Distilling full-frame video into a set of individual point features.
2. Finding a model that accurately represents the human motion.
3. Apply that model to a detector that can determine if a cluster of moving points is representative of human motion.

2. SYSTEM ARCHITECTURE :



1) Pre-processing:

The pre-processing stage consists of two sub-stages:

a) Low pass filtering:

We have applied Low pass filtering on the stream of input images which involves in convolving the image by special masks specified.Low pass filter is used for removing high frequency component and it will allow only low frequency component. It will remove the noise from image by blurring it.

Ideal low pass filter has the transfer function as below:

H (u , v) = 1 if D(u , v) <= D0
= 0 if D(u ,v) >D0

b) Edge detection:

Edge detection is the most common approach for detecting meaningful discontinuities in gray level. It is required to detect the motion of humans. Edge detection is done by making use of two techniques-sobel operators and variance method.

The sobel technique which we have implemented on filtered images does not have very clear output. This problem is solved in variance technique by taking square root of summation of difference of pixels.

c) Sobel Edge Detection:

It is a discrete differentiation operator, computing an approximation of the gradient of the image intensity function.

First derivatives in sobel technique are implemented using magnitude of gradient. For a function f(x,y) magnitude of gradient is given by

▼ ▼f = | Gx | + | Gy |

The masks shown below are called sobel operators.

$$\begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{bmatrix} \qquad \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix}$$

The x-coordinate is here defined as increasing in the "right"-direction, and the y-coordinate is defined as increasing in the "down"-direction. At each point in the image, the resulting gradient approximations can be combined to give the gradient magnitude, using:

$$\mathbf{G} = \sqrt{\mathbf{G}_x^{\,2} + \mathbf{G}_y^{\,2}}$$

Using this information, we can also calculate the gradient's direction:

$$\boldsymbol{\theta} = \boldsymbol{arctan}\left(\frac{\boldsymbol{Gx}}{\boldsymbol{Gy}}\right)$$

where Θ is 0 for a vertical edge which is darker on the left sides.

The idea behind using weight two is to achieve some smoothing by giving more important to the center points. From these masks Gx and Gy are:

Gx= (z7+2z8+z9)-(z1+2z2+z3)

Gy= (z3+2z6+z9)-(z1+2z4+z7)

d) Variance Edge Detection:

It is another technique that we have applied for the edge detection. It gives better results than sobel edge detection techniques. It is not using operators like sobel. It processes each pixel in the image.

It first takes a pixel than makes an nxn window for the processing of that pixel. The output of the variance is depending on the value of n. After processing it will replace the value of that pixel by new value.Algorithm is as follows[5]:

```
Take an image of  L x M size.
For each pixel f(x,y) in image
{
    Take an nxn window
    Take the difference of f (x,y) and other pixel in image.
    Sum the square of the difference
    Square root of sum(S)
If ( S > 255) then S = 255
        Set new value of  S to f(x,y)
}
```

1 Human Detection:

The outputs of preprocessing are fed to the human detection techniques. We have implemented two techniques for human detection. Background subtraction is a very simple approach for detecting humans which take the difference of two consecutive frames. It gives erroneous outputs in the cases of environmental changes or dynamic background.

a) Background Subtraction:

The goal in background subtraction is to separate background areas of the image from foreground regions of motion that are of interest for human tracking. It generates a foreground mask for every frame. This step is simply performed by subtracting the background image from the current frame.

$$O(x, y) = |C(x, y) - B(x, y)|$$

b) Segmentation:

We use segmentation, thresholding followed by morphological operation to solve that problem in th background subtraction.

One of the techniques of segmentation is Clustering. The K-means algorithm is an iterative technique that is used to partition an image into K clusters. The basic algorithm is:

- Pick K cluster centers, either randomly or based on some heuristic.
- Assign each pixel in the image to the cluster that minimizes the variance between the pixel and the cluster center.
- Re-compute the cluster centers by averaging all of the pixels in the Nayan Agrawal, Priyanka Agrawal, Manisha Dandge, Vibhuti Thakkar, Akash Wakodkarcluster
- Repeat steps 2 and 3 until convergence is attained (e.g. no pixels change clusters).

Histogram based segmentation finds foreground and background peaks and using those peaks it calculates threshold values.

- First Compute the histogram H of the image..
- Histogram Smoothing.
- Calculate the peak values in the histogram.
- Calculate two threshold points from computed peak values.
- Threshold the image using threshold points.

After finding threshold points from the image (High and Low) , we will perform threshold operation on the image. If the pixel value is between High and Low then it will set as a white pixel otherwise set it to 0 which the value for black. The algorithm is shown below[4].

High and Low Threshold Value

```
For each pixel f (x, y) in the image
If ( f(x,y) > Low and f(x,y) < High )
        Set the value to 255 (white pixel)
Else
Set the value to 0 (Black pixel)
```

2 Morphological Operation:

Morphological operators often take a binary image and a structuring element as input and combine them using a set operator (intersection, union, inclusion, complement). They process objects in the input image based on characteristics of its shape, which are encoded in the structuring element.

a) Dilation:

Dilation is one of the two basic operators in the area of mathematical morphology, the other being erosion

The dilation operator takes two pieces of data as inputs. The first is the image which is to be dilated. The second is a (usually small) set of coordinate points known as a structuring element (also known as a kernel). It is this structuring element that determines the precise effect of the dilation on the input image.

Dilation is used for bridging gaps. A and B are two sets in Z2. The dilation A by B is defined as[1].

$$A \oplus B = \{z \mid (B^{\wedge})\, z \cap A \neq \emptyset\}$$

This equation is based on obtaining the reflection of B about its origin and shifting this reflection by z. Set B is commonly referred as structuring element in dilation.

b) Erosion :

Erosion is the dual of dilation, i.e. eroding foreground pixels is equivalent to dilating the background pixels[1].

$$A \ominus B = \{z \mid (B)\, z \sqsubset A\}$$

Thus erosion of A by B is the set of all points z such that B translated by z is contained in A. Erosion is used for eliminating irrelevant detail in an image.

1. Human Tracking:

Human tracking involves detecting the human motions and their activity. One technique tracks the motion by finding the objects in the image sequence. But the windows which are created on the objects are not identical when two persons overlap.

The simple tracking algorithm is as follows [6].

- Take the images from the background subtraction.
- For each image in the video
- Find out the two points for each objects
- To find out points use manual search and sorting
- Draw the windows around objects

This technique has some problems. When two objects are coming into view area then they are assigned with one window to each. For example person A has window of x color and person B has a window of y color. When they both are cross each other then at the time of overlapping two both the objects come in only one window. So we have one window for two objects. This is not the expected output.

The second technique involves finding feature points from the image. The method for identifying points of interest in a series of images and tracking their motion is called feature point selection method.

Take an image I (x , y)

Gx = Convolve image I with $\begin{pmatrix} 0 & 0 & 0 \\ 1 & 0 & -1 \\ 0 & 0 & 0 \end{pmatrix}$

Gy = Convolve image I with $\begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & -1 & 0 \end{pmatrix}$

Gxy = Gx * Gy

Gxs = Gx * Gx

Gxy = Gy * Gy

A = Convolve Gxs with $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$

B = Convolve Gys with $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$

C = Convolve Gxy with $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$

T = A + B

D = AB – C2

Q = 4D / T2

If Q (x , y) > Qmin

W = D / T

else

W = 0 (set it to black)

If the value is greater than Qmin then set the value to D/T other wise make it black. So the pixels which have the maximum value on the output image will be best tracking point. Here we will find the maximum value from the region of the object.

Then we apply Knade–Lucas–Tomasi filter to track those feature points[10].

- Choose a small window; say 7 pixels on a side, around a pixel of interest in frame 1. This pixel of interest will be called pixel A.

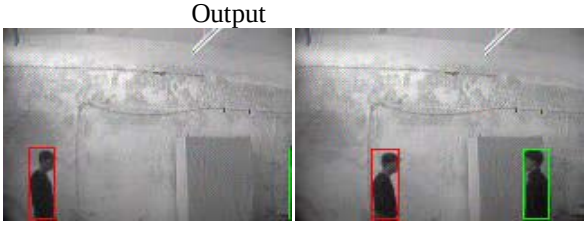
- For each pixel near A in frame 2, call it pixel B, and perform the following:
- Subtract the value of each pixel in the 7 by 7 region around pixel A from each pixel in the 7 by 7 region around pixel B. Square the result of the difference, and sum these 49 values to produce'dissimilarity' for this choice of pixel B.
- The pixel B in frame 2 with the smallest dissimilarity is considered to be the new location of pixel A in frame 1.

3. Results:

Sample output of the system are shown below.We can see human detection and tracking in the output.

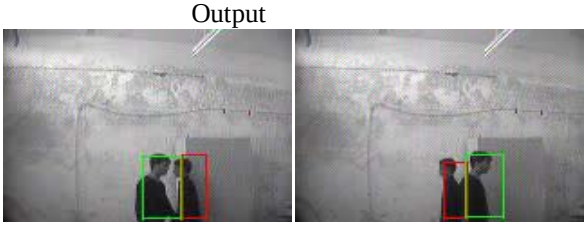
Input

Output



Input

Output



Input Output

4. Conclusions and Future Work:

We have successfully developed a system for detecting human and their motions. Thus, any moving object that has roughly the shape of a human and moves with the speed expected of a human will be detected as a human. The outputs of tracking algorithm are used for the real time video surveillance system. The system presented here serves as a successful proof of concept for a robust human motion detector in the field.

There are a variety of enhancements that could be made to this system to achieve greater detection accuracy and increased robustness.

1 Objects could be tracked between frames rather than simply performing human motion detection on single frames.

2 The current segmentation algorithm can be confused by too much fast lighting change moving shadows.

3 From the current system, client-server model can be created ,in which client have access to view the tracked videos and images.

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Autonomous Position Verification and Authentication for on Demand Routing Protocol for Ad Hoc Network

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Abstract:

An ad hoc network is a group of wireless mobile computers, in which individual nodes cooperate by forwarding packets for each other to allow nodes to communicate beyond direct wireless transmission range. Attacks on ad hoc network routing protocol affects network performance and reliability. Traditional routing protocols have no security mechanism and can be attacked by malicious nodes. In this paper, we present secure on demand position based routing protocol for ad hoc network based on basic operation of AODV protocol. The protocol makes use of protected position information to make routing decisions, resulting in improved efficiency and performance. In AODV protocol route selection is a function of hop count and destination sequence number. In our proposed model, the route selection is a function of following parameters: hop count, trust level of node and security level of application. In this paper, we focus on secure neighbor detection, trust factor evaluation, operational mode, route discovery and route selection. The paper mainly addresses the security of geographic routing.

Keywords—Ad hoc Network, Geographic Routing, Trust Factor Evaluation, Secure Neighbor Detection, Security, AODV, Hop Count.

1. Introduction

Most traditional mobile ad hoc network routing protocols were designed focusing on the efficiency and performance of the network. Ad hoc network are wireless network with no fixed infrastructure in which nodes depend on each other to keep the networked connected. Topology based routing protocols use the information about links for packet forwarding. Position based routing protocols use node's geographical position to make routing decisions, resulting in improved performance under extremely dynamic network condition.

Attacks on AODV protocol

In AODV protocol the main design issue is to achieve efficiency in ad hoc network environment while disregarding security issues. Known attacks on AODV are traffic redirection by modification, replay attacks, loop formation by spoofing, false route error.

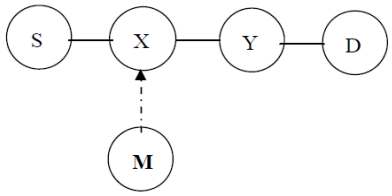

Fig. 1: Attacks using modification

Suppose node S in Figure 1 sends a RREQ with destination D. A malicious node M can receive it and read the destination sequence number as it is not encrypted. So M can send a RREP with greater sequence number to X. M can redirect traffic to itself. Node S will drop original copy of RREP, as it already has received a RREP with greater sequence number. In AODV protocol, the attacker can reset the value of hop count field so that it can later include itself with the route. There are two replay attacks in ad hoc network: RREQ flooding attack and wormhole attack [4][5].

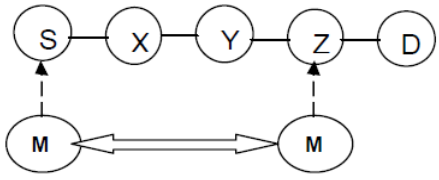

Fig. 2: Wormhole attack

In AODV protocol when a node needs to communicate with another node broadcasts RREQ to it's neighbors. The process continues until a route to the destination is found. S

wants to communicate with D, so it broadcasts a RREQ packet to it's neighbor X. Attacker M1 records the request and tunnels it through a fast channel to another attacker M2. Node Z will get the request from M2 and process it. Thus the attackers force to use the route via M1 and M2 to reach D.

AODV Protocol

In AODV protocol a source node wishing to communicate with a destination node first broadcasts a RREQ packet to its neighbors. On receiving, the desired destination node send reply packet RREP back to the source. Each node maintains only the next hop information to reach to destination.

In AODV protocol the route selection is based on following factors: hop count, destination sequence number. Hop count determines the length of the route and sequence number represents the freshness of the route information.The route selection metric is independent of trust factor of node and security level of application. By summarizing the attacks on AODV routing protocol, it is evident that secure neighbor detection and verification of node's position is the basic building block of our proposal. In RREQ some fields need to be secured. Hence some security mechanism for encryption/decryption must be adopted. In our proposed model, an additional parameter is added to determine the suitable route for any application: security level required by application [4].

Assumptions and Scenarios

The following figure represents the modules involved in our proposal.

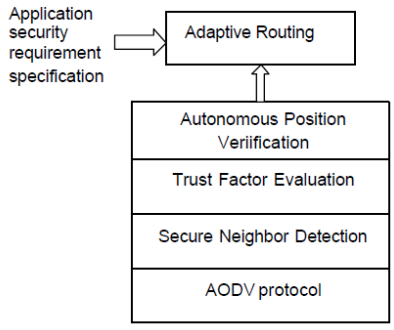

Fig. 3: Conceptual Framework

Scenario: The partners of company communicate through ad hoc network to exchange different ideas, policies and personal information. We classify different application with specific security requirement as follows.

Application	*Security requirement*
Exchange of new business ideas	Very high
Review of financial details of the company	High
Review of employee's performance	Low
Exchange of unofficial information	Very low

Fig. 4: Assumed security requirement of applications

2. Secure Ad Hoc Routing Protocol

Setup

Most of attacks on routing protocol are due to absence of encryption for some fields in the routing packets. Unauthorized modification of such fields could case serious security threats. We use DES for encryption mechanism. Each node in the network maintains a public/private key pair, certificate for public key identity signed by trusted certificate server and public key of trusted certificate server T. The certificate is to be valid for certain time period. Each node has T's public key, so it can decrypt certificates of other nodes. Each node maintains a neighbor table that contains TUSN (time stamped sequence number), neighbor ID, neighbor public key, location coordinates, neighbor group key, trust value of neighbor. Each initiator node maintains a node status table that contains destination ID, packet ID,forwarded (y/n) and unaltered (y/n). Each initiator node maintains recent destination list that contains destination ID, number of hops and time. Each node maintains a trust table that contains neighbor ID, trust value, trustworthy (y/n).

Secure Neighbor Detection

A node N broadcasts a hello message M1 with it's certificate. The target node receiving the message M1 decrypt N's certificate to verify and obtain N's public key. The target node sent the reply through message M2. After receiving the response, N stores the nodes public key and recent location coordinates of the target node in it's neighbor table. Node N records the sending time of M 1 at t0 and receiving time of M2 at t1 [6].

Total delay $d = t1 - t0$

Distance between the nodes must be less than $(d/2) * c$,

Where c is the speed of light. Thus node N can check that the other party is within its transmission range.

Trust Factor Evaluation

Each node maintains a database of it's neighbors with dynamically updated trust factor [2].

Neg_ID	*Trust value*	*Trustworthy*
X	6	Yes
Y	5	Yes
Z	3	No

Fig. 5: Trust table

Each node is assigned a trust value based on it's reliability. The trust value of the node can be –1 (malicious), 0 (not trusted), 1 to 3 (low trust level), 4 to 7 (standard trust level), 8 and 9 (high trust level). In our protocol, as long as the node's trust value = 4 it is assigned 'yes' meaning trustworthy otherwise it is 'no' meaning untrustworthy. Node1 authenticates it's neighbor Node2 using it's trust value. If Node2's trust value is in trust table and the value is 'yes', then Node2 is trusted. If the value is 'no', then Node2 is not trusted. If Node2 is not in the table, then Node1 will send a trust_request to all other trusted nodes for Node2's trust value.

Node Status Maintenance

The trust value of each node is selected based on node status. Each initiator node maintains node status information of it's neighbor nodes in form of table.

Neg_ID	*Packet_ID*	*Forwarded (Y/N)*	*Unaltered (Y/N)*
X	101	1	1
Y	102	1	0

Fig. 6: Node status table

Degrade Mechanism: The trust table is updated periodically for a predefined time period 't'. A threshold value 'P' is predefined used to detect a node as malicious. To evaluate the trust value of the node, we should count the number of successful forwards by the neighbor node. This can be done by applying logical AND operation to the last two fields and summing up all 1's generates the number of successful packet forwards [4].

Upgrade Mechanism: It uses the same algorithm for building the transfer string as explained in the previous paragraph. The success rate is computed by summing up the number of consecutive 1s from the LSB. If the success rate exceeds the threshold 'P' the trust factor of the node is incremented by 1.

Mode Selection

Additional routing fields are added in both RREQ and RREP packets. In RREQ field a two bit mode selection field is added. The mode field represents the required security level for the application. In general, the protocol consists of two operational modes [4].

Mode 0: No Encryption

In this mode, the protocol functions as a simple AODV protocol. The initiator can select this mode when the application does not require any security.

Mode 1: With Encryption & Trusted Path

In this mode, the protocol applies encryption mechanism to authenticate packets and packets are routed only along the trusted path.

Mode 2: With Encryption & Minimum Hop Count

In this mode, the protocol applies encryption mechanism to authenticate packets and packets are routed only along the shortest path.

Route Discovery

Route Request: A node wishing to communicate with destination node broadcasts the RREQ packet to its trusted neighbors. A RREQ contains the following fields: RREQ sequence number, destination ID, N's distance to D, D's position coordinates and TUSN, all encrypted with group encryption key [3][4]. The sequence number is incremented each time a node initiates a RREQ. TUSN represent the freshness of location information. The receiving node attaches the trust level of it's neighbor. The process repeats to all intermediate nodes until it reach the destination.

Route Reply: Upon receiving the RREQ the destination node respond with RREP packet containing RREQ sequence number, it's coordinates and TUSN. It signs the RREP with private key and encrypt it using group encryption key of it's neighbor. The reply propagates along the reverse path of RREQ. While receiving the RREP packet intermediate nodes decrypt it with their private key and verify the signature. Each intermediate node update the location field in neighbor table based on recent RREP packet [6].

An example: Suppose that a network is consisting of the nodes labeled S(source), D (destination) and from alphabet A to I. The source wishes to communicate with the destination. At first, the source selects the mode as 1 based on the required security level of application.

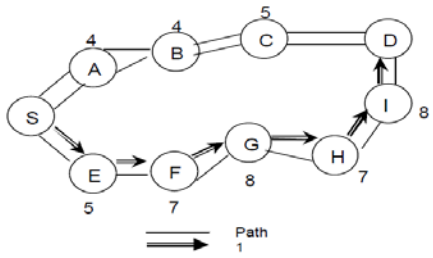

Fig. 7: Modified routing protocol

Neg_ID	*Trust value*	*Trustworthy*
A	4	Yes
E	5	Yes

Fig. 8: Trust table of source node S

The numbers shown closer to each node indicate their corresponding trust level. Node S to communicate with node D broadcasts RREQ to it's neighbors A and E. There are two possible paths from node S to D: S-A-B-C-D (path1), S-E-F-G-H-I (path2). Node A tries to authenticate the source node S. It checks it's trust table. If S is trusted, A accepts the RREQ message, update the location field and TUSN in it's neighbor table and broadcast the RREQ to the next node. If S cannot be trusted, A drops the RREQ. If S is not in A's table, A send a trust_request to S. If the response is 'yes', A stores the information in it's trust table and rebroadcasts the RREQ. When the response is not received within a limited time, node A drops the RREQ. As a result node A forwards to B, B forwards to C and C forwards to destination D. Similarly in path 2, E forwards to F, F forwards to G, G forwards to H, H forwards to I and I to destination D.

The destination D unicasts the RREP to C and I separately. Node C send the reply to node B. Node B forward the packet to A. But before sending, each node attaches the trust level of the node from where it just received the RREP. Upon receiving the RREP, each node update the recent destination list. The node attaches the trust level of C to trust string. So the trust string now contains the value 5. Node B forwards the RREP to A. Now the value of trust string is 4. The process continues until it reaches the source node. So the final value of trust string for the path 1 is 544. Similarly in path 2 node I forwards the RREP to I. The process will be similar as in path 1. The final value of trust string for the path 2 is 87875.

Now the source waits for a predefined time period to select the best route. The application requires trusted path for communication. The average trust weight of path 1 is 4.33 and trust weight of path 2 is 7. Hence path 2 is selected.

Autonomous Position Verification

The location based routing protocol require that a node be able to identify it's own position and position of destination node. This information is obtained via global positioning system (GPS) and location services. In the routing protocol,location information is distributed between nodes by means of position beacons.

All network used in MANETs have a maximum communication range. Based on these properties, we define acceptance range threshold 'T'. Position beacons received from nodes that are at position larger than 'T' away from current position of receiving nodes can be discarded. Position can also be verified based on the mobility of the node. It is assumed that all nodes move at well defined speed. When receiving a beacon the node records the arrival time of beacon. On receiving subsequent beacons, the node checks the average speed of nodes between two positions in two beacons. If the average speed exceeds mobility grade T, the position beacon is discarded [1].

Results and Future Work

```
A receives beacon from B
if distance(A's position, B's position) = T
 if B is in A's neighbor table
 update the position information of B
 else
 add B's ID, position details in A's table
else
 reduce trust value of B
 drop beacon
```

Fig. 9: Algorithm for position verification based on transmission range

```
A receives beacon from B
t=time of last beacon from B
if B is not in A's neighbor table
 add B's ID, position details in A's table
else
 old=position of B in A's table
 new=position information in beacon
 speed=distance(new,old)/(current time-t)
 if speed=Max.speed
 update position and time details
 else
 reduce trust level of B
 drop beacon
```

Fig. 10: Algorithm for position verification based on mobility

The protocol discussed overcomes all known vulnerabilities of the existing protcocols. It uses DES encryption mechanism to secure the fields in routing packets. The most severe attacks on MANETs is warm hole attack. The presented solution overcomes the attack by applying efficient secure neighbor detection mechanism. To enhance the security level of discovered path, route selection is done based on trust level of nodes along the path. In order to secure position coordinates of each node, we employ a position verification system. The proposed protocol can be simulated using network simulator like ns2.

Conclusions

In this paper proposed a secure routing protocol with autonomous position verification. The protocol follows different routing mechanism based on the security level required by application. In mode 1, the packets are routed along the trusted path based on the trust factor of the nodes. In mode2, the packets are routed along the shortest path based on hop count. The protocol uses a mechanism to detect and overcome the effect of falsified position information in geographic routing position. The protected position information reduces the routing overhead and increase the security of routing.

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JawaTeX Web: Web Based Latin to Javanese Characters Transliteration System

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Abstraction

Transliteration is a substitution letter by letter from one alphabet to another, free from how to actually speak those characters or it can be called a letter substitution or transliteration. JawaTeX can run in both Linux or Windows by make minor change to source code. This transliteration model can add a number of TeX based transliterator. By developing JawaTeX class or style in TeX, then the Javanese characters are expexted to be equal with other etnic characters such as ArabTeX, ChinaTeX, dan ThaiTeX and are most likely to be recognized by the global community.

JawaTeX is developed using several methods, The Context Free Recursive Descent Parser for parsing, rule-based for patern spliting and Pattern Matching method for mapping into LaTeX class. This paper explain how JawaTeX work using web interface, the address of the site of JawaTeX can be found at http://jawatex.org. The results of Web based Latin to Javanese characters transliteration system are pdf document or figure that embedded on HTML.

The web transliteration provide 3 mode of transliteration: automatic mode, manual mode and embedded HTML. Automatic mode is done by uploading Latin text document that will be transliterated into pdf as result. The manual mode done by writing the input text on the HTML form, the result is also pdf document. The embedded HTML mode will transliterated the tex written in specific input format into figure on png format and inserted to HTML syntax.

Key words: web based transliteration, Javanese characters, embedded HTML, LaTeX, JawaTeX

1. Introduction

Javanese characters (script) is the second script used by approximately 71 million citizens of Yogyakarta, Central Java and East Java. But there was only very little effort to preserve it in the form of computer text (digital). In many other countries, the research has been done to develop character processing for their local culture. This paper is influenced by the research of Free Open Source Software Localization (FOSS) [3] to develop software based on where the software is built. According to The Localization Industry Standards Association (LISA), Localization encloses product building that is appropriate to target culture (region and language) where the poducts are sold [2]. ArabTeX is a system for computer based typesetting of texts in the Roman script, which may contain insertions in some right-to-left script as Arabic and Hebrew [6]. TeX/LaTeX based transliteration is a transliteration using TeX/LaTeX. Many researchers do some researches in TeX/LaTeX based on transliteration; such as ArabTeX by Klaus Lagally, ChinaTeX by Shujun Li and ThaiTeX by Manop Wongsaisuwan [11]. Metafont program is used to develop fonts that are used by ArabTeX [5].

Until this research is written, there are three Latin-Javanese conversion program, namely Pallawa v 1.0, Hanacaraka v 1.0 and Carakan v 1.0.1. Several weaknesses from those three programs are the conversion result is not easy to be transliterated to other media or printed, not all programs can convert a text file and the result of conversion is not in accordance with the rule. In addition, not all Latin character writing can be transliterated to Javanese characters. There of them cannot written Javanese and Latin characters side by side and also can only be run in Microsoft Windows operating system.

2. JawaTeX

The development of JawaTex is intend to build transliteration model of Latin to Javanese hopefully can transliterate all possibility of caharcter variation on input document. inputc characters variation. The methods using in this transliteration are, The Context Free Recursive Descent, rule-based and Pattern Matching.

The Context of Free Recursive Descent Parser algorithm is used to browse and split the text document [5]. A Rule-based method is used to develop Latin string split pattern list which result

from Latin text document processing. The Rule-based method is used to build several rules to handle the problems that can not be handled on previous researches. The Pattern Matching method is used to match each Latin string split pattern into LaTeX mapping format forms. The rule in transliteration model is made according to linguistic knowledge from a book guidance of writing Javanese script written by Darusuprata and published by Pustaka Nusatama Yogyakarta Foundation that cooperate with the government of the special region province of Yogyakarta, the government of central Java, and government of West Java [1]. The Rule-based method is used to build several rules to handle the problems that can not be handled on previous researches. The schema process of Latin to Javanese character transliteration with rule based is in figure 1.

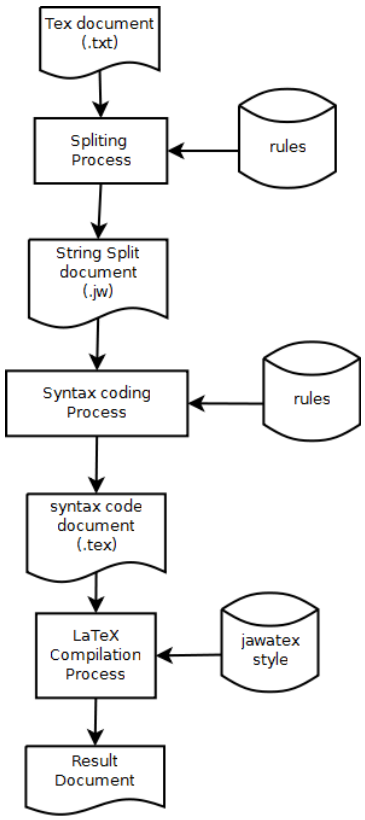

Figure 1: The schema process of Latin to Javanese character transliteration with rule based

The Latin text document is parsed to determine the list of Latin string split patterns as token. The parser method used in this research is The Context Free Recursive Descent Parser. The Latin text document processing becomes the list of the Latin string split pattern by using rule-based method, whereas the matching process of each Latin string split pattern in maping form of LaTeX uses Pattern Matching method. With the rule-based method, the unsolved problems of the previous researhes can be overcomed by using certain methods. The established transliteration model is suppported by the production rule of browsing the Latin string split pattern, the models of the Latin string split pattern, the production rule for the Latin-Javanese character mapping, the models of syntax coding pattern, style or macro LaTeX, Javanese character Metafont, and JawaTeX program consisting of parsing program and LaTeX style used to code LaTeX syntax. JawaTeX program consists of checking program and Latin string split to browse the Latin string pattern and LaTeX style which are used to code LaTeX syntax. Program transliterasi ini dapat dijalankan pada sistem operasi yang mendukung LaTeX dan Perl. Selain itu program ini juga dimodifikasi untuk dapat dijalankan melalui media web. The framework of Latin to Javanese character transliteration with LaTeX is in figure 2 [7].

Processing the Latin text documents into the TeX-based Javanese characters has two modes of transliteration, namely: automatic mode and manual mode. Automatic mode designed for users who do not have the knowledge to determine Latin string split and syntax coding patterns. Most of the stages of the process performed by the system, include [7]:

1. Determining the correct writing of Latin string in the source text by matching the source text and dictionary. This stage will result the Latin text documents that the writing of Latin string has been corrected.
2. Determining the formatting of Latin string by read, examining, modifying, altering, converting, inserting or adding other characters to meet the requirements of writing formats. The modification is only in the writing format form and does not change the meaning.
3. Determining the split string Latin pattern refer to 177 split pattern models that will produce 280490 Latin string patterns. This stage produce a list of Latin string split patterns that compose text document. The list of Latin string split pattern that has been obtained and then determined in the pattern of the relevant mapping transliteration to replace any Latin string split pattern into Javanese.
4. Determining the pattern syntax code which refers to the 57 coding syntax models. At the stage of correct pattern mapping, the first is to determine the position of Javanese characters as

the scheme of Javanese characters writing. Every split of the Latin string pattern can site the alphabet blocks consisting of 5 rows and *n* columns [6]. This stage produces a list of syntax codes that will be used for transliterated split of the Latin string pattern which pattern layout has been obtained using the TeX/LaTeX format, are called the intermediate text.

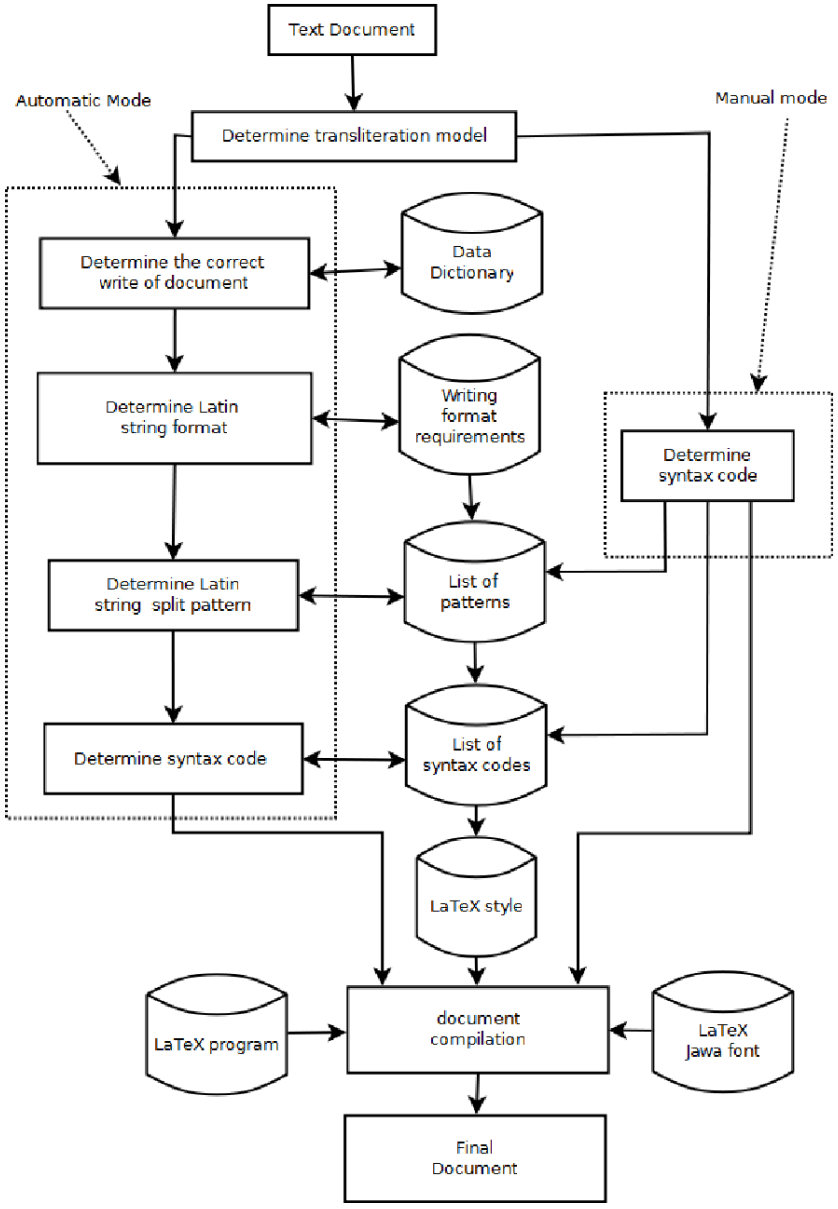

Figure 2: Framework of Latin to Javanese character transliteration with LaTeX

After all 4 steps are performed automatically, the next stage is to compile the document. Intermediate text that has been obtained is compiled then *JawaTeX.sty* and *Jawa.tfm* are used by TeX to compile the document. *JawaTeX.sty* contains a Javanese script writing rules in a style TeX form, which includes [7]:

1. The word mastery which is different for example in a name.
2. The rule to combine the characters merger and define how to place and combine the characters.
3. Determining the shape of characters that is required in the merger because the Javanese characters have a lot of variety. A character in Javanese will have a different shape if it is placed in different positions despite having the same sound. A character in Javanese can also be possible to be paired with some Java characters

depending on the surrounding characters and the placement is not always in the back of the previous characters, but sometimes it must be inserted between the previous character. In addition, there are some characters that should not be paired with other characters, so that should replace the previous character. *Jawa.tfm* is font codes known by TeX and is a result of Metafont compilation.

Manual mode is intended for users who have the knowledge to determine the Latin string split patterns and syntax coding. There are 3 stages, the first is the correct of source text writing, the second is the writing of the Latin format string and the third is the split of Latin string patterns in which all of these have been in the mind of users, who then arrange in the intermediate text that is ready to be compiled.

3. Web Based JawaTeX

Web based JawaTeX ia web interface for JawaTex. The site build using CMS Drupal to provide the user interface. On this web based transliteration provide 3 mode of transliteration : otomatic, manual and embedded HTML.

The automatic mode is done by uploading text document that will be processed JawaTeX as running in text mode (console). Text document that will be transliterated to Javanese character written using text editor and save as .txt documen. The document show on figure 3 is example for document source that will be transliterated.

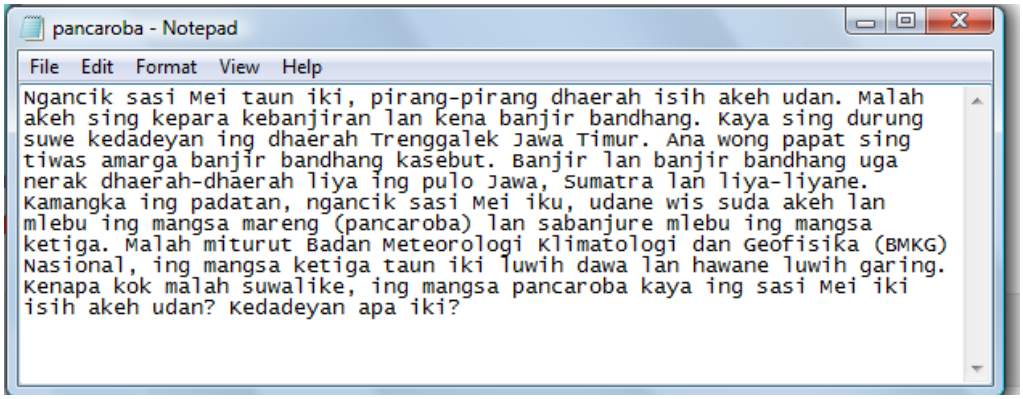

Figure 3: Text Document input

The process of transliteration is begin after text document is uploaded, The figure 4 show the upload input form. The proccess of transliteration on this stage same as show on figure 2 at automatic mode except determine correct word part. The web Jawatex on automatic mode not checking the correct words of document that being upload

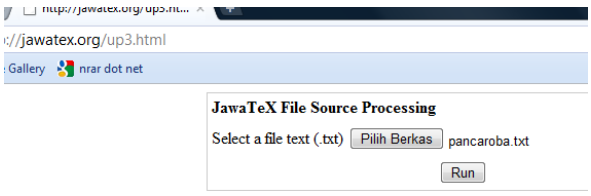

Figure 4. The Upload Form

The result of transliteration process is a pdf document. The link to the document is made to make document downloadable (figure 5).

Figure 5. Downloadable document link

The pdf document can be saved or viewed using pdf viewer such as Acrobat Reader. On this mode all text in input file will be transliterated into Javanese charaters as show on figure 6.

Manual mode on JawaTeX web is like automatic mode in transliteration process but the input process is differerent. On manual mode input is using HTML FORM instead uploading text file (figure 7).

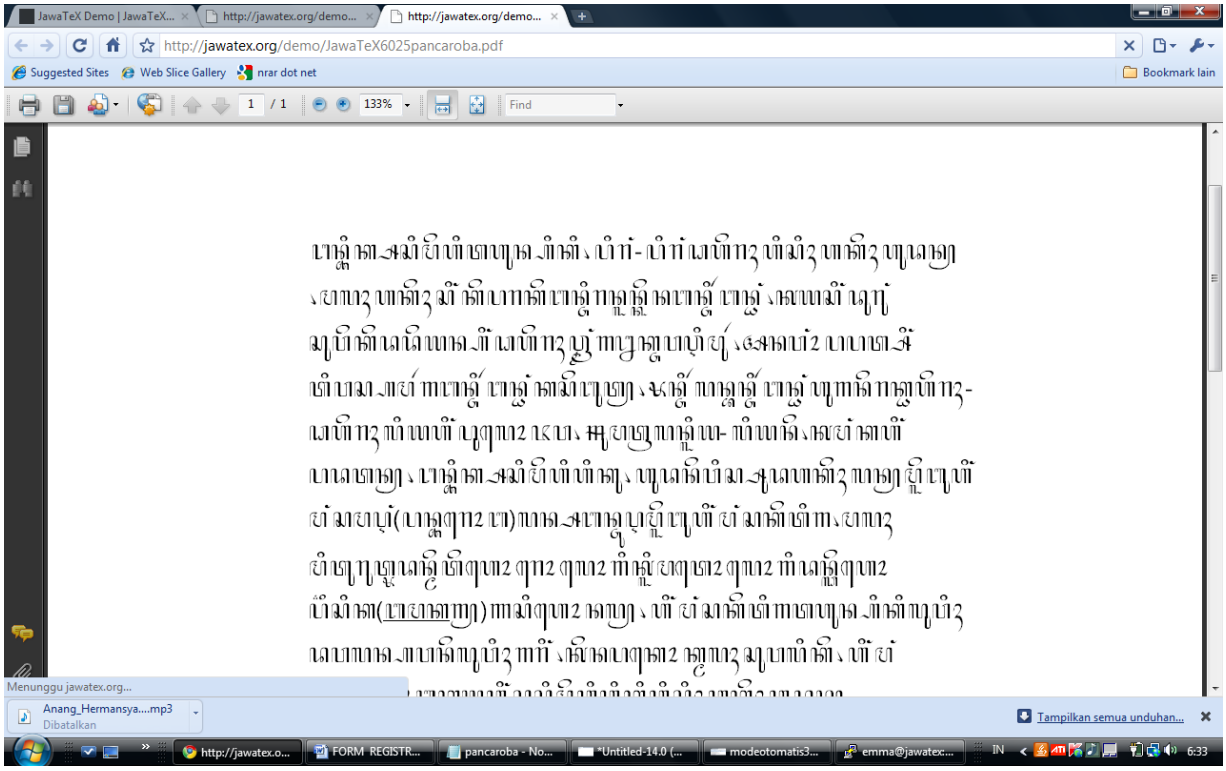

Figure 6. pdf document viewed

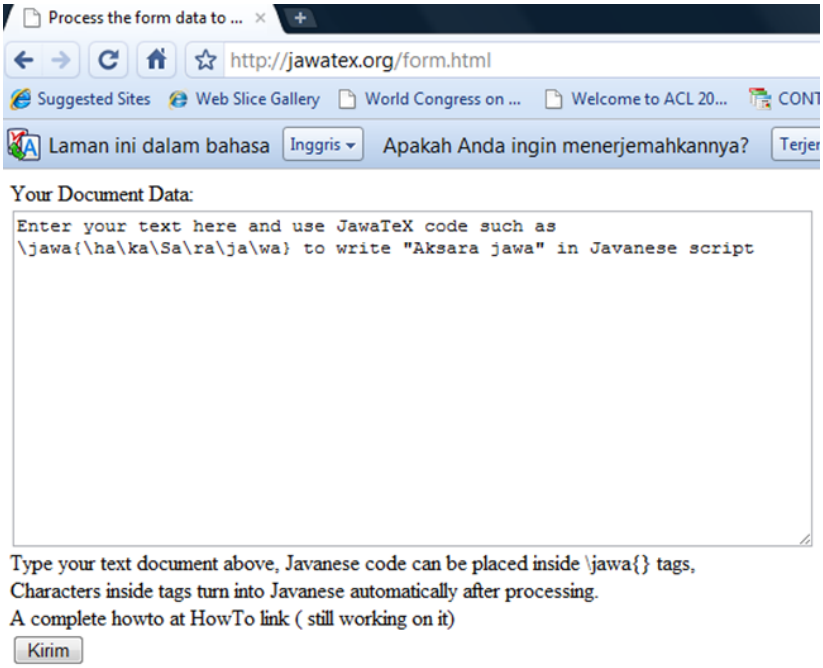

Figure 7. HTML FORM input

This mode require user to know JawaTeX codes. JawaTeX codes is write using syntax *\jawa{codes}*. Only codes inside syntax JawaTeX will be transliterated into Javanese characters and rest of text are not. After the form is submitted the text inside form will be saved and formated as LaTeX document. The LaTeX document than processed into pdf

document. The link willl be ready after pdf docuement created as show on figure 8.

Figure 8. Pdf Document Link (manual mode)

The result of pdf document is differ form automatic mode. Link can be saved or viewed like in automatic mode. The manual mode will result pdf document contain Javanese characters and Latin characters. The figure 9 show pdf document that contain both Javanese and Latin characters.

4. Embeded JawaTeX

In this mode using Drupal CMS and Drutex module. DruTeX is a powerful LaTeX module for Drupal. It can be used to display mathematics written in LaTeX as images inline with other text, or separately as a downloadable pdf.[8]

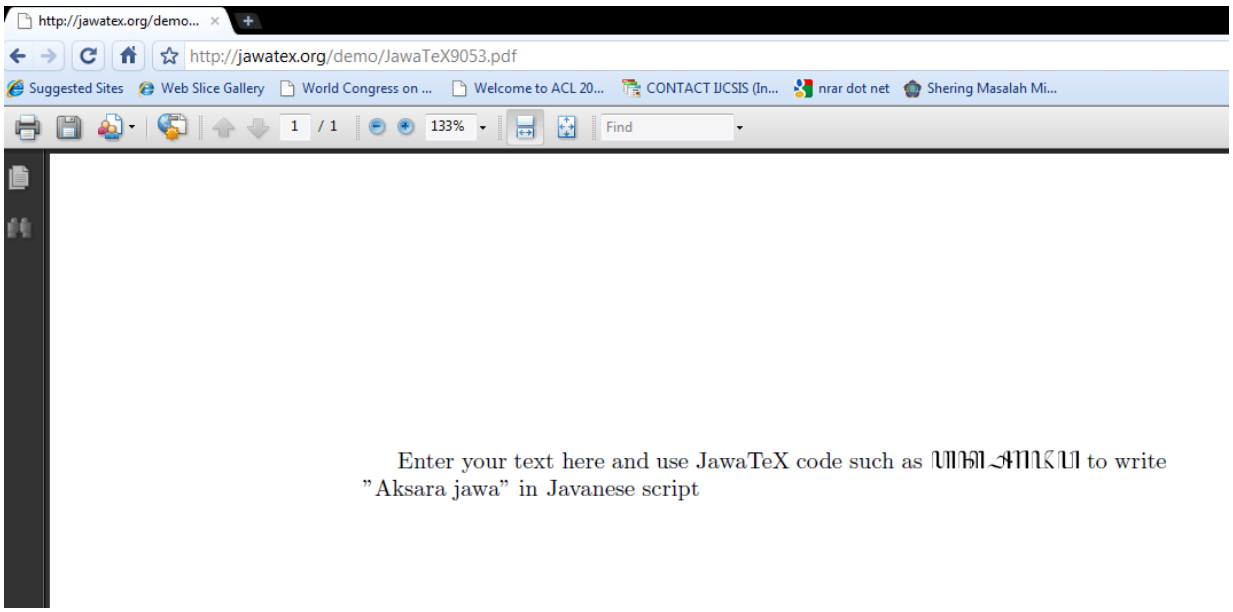

Figure 9. The manual mode result

JawaTeX web using this module to write Javanese characters inline with Latin characters in HTML format. Drutex module using <*tex*> and </*tex*> input format, the codes is place inside the input format.

The Drutex module is modified to use by JawaTeX. The codes JawaTeX are put in the input format. The work of modified Drutex module is show on figure 10. Every code in modified DruteX module will be process by JawaTeX to .dvi file and coverted into image (.png). Each <*tex*> </*tex*> code will produce an image. Each image will have unique name for unique content. Every code inside <*tex*> </*tex*> will be saved as .tex file and hash to get a filename. The result, png file than inserted on HTML document. Example of this embedded HTML is show at Figure 11.

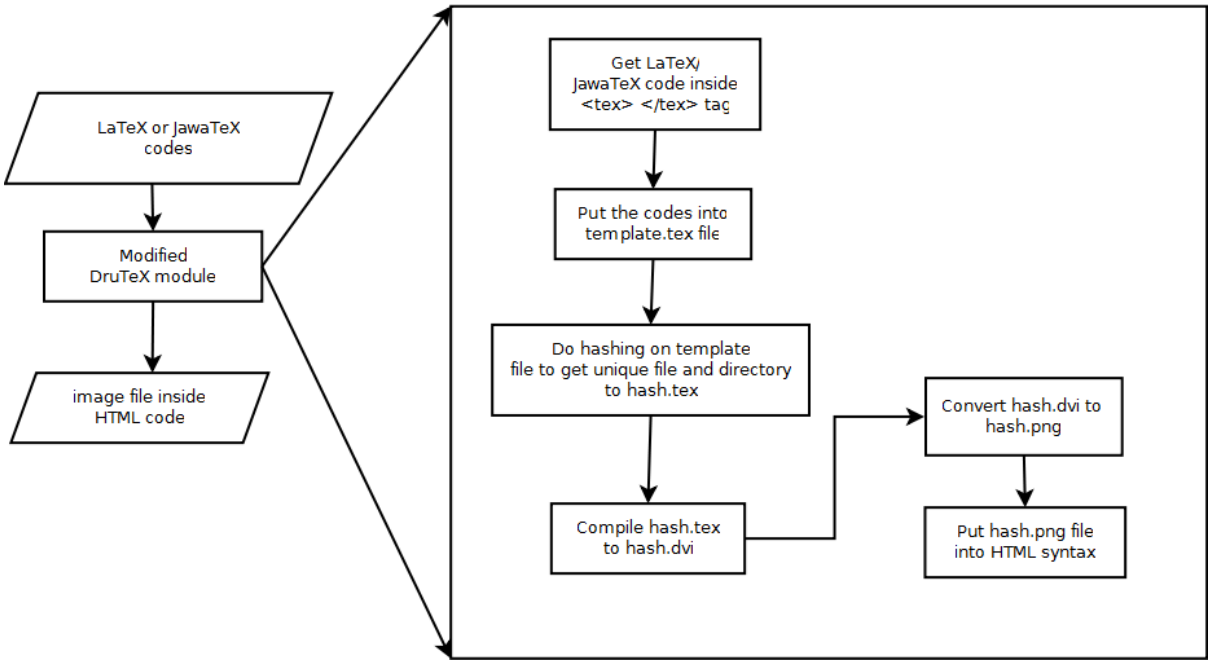

Figure 10: The schema process of embedded JawaTeX

Figure 11: Result on embedded mode

5. Result

Model formulation of this text document transliteration can improve the existing Latin to Javanese characters machine transliteration. By constructing a complete production rules, transliteration models can be created to handle the problems that occurr in previous studies. This transliteration model can transliterate all possible combinations of characters that make up the Latin text of a document, without limiting the natural language used to create the Latin text documents.

The research result is expected to facilitate schools, institutions, Department of Culture and Education, museums, tourism, Heritage Protection Department, Institute of Traditional Culture Heritage which need transliretarion from Latin document to Javanese characters for education, promotion, publication or publishing needed. This research result can be an educational tool and as step foward as well in the Java culture inheritance espesialy Javanese characters heritage in information technology era. The existing way to write Javanese characters is often inconsistent in character size and shape, by building the Latin to Javanese text document transliteration supported by the complete production rule to be able to handle the complexity in wrtiting the Javanese

characters and can produce the good shape, beautiful and consistent Javanese characters.

The transliterator system framework include production rule of latin string split pattern browsing, string split pattern models, syntax code pattern models, LaTeX style, Javanese characters Metafont, and JawaTeX program package contain parsing and LaTeX style to write LaTeX syntax code. A JawaTeX program package contains two programs, checking and breaking Latin string to get the string split pattern and LaTeX style to write LaTeX syntax code.

The result of this research is able to perform the rules that haven't existed especially the consonant group findings, and finally the Javanese characters can be improved farther and completely. The implication ahead is that it is the time for Javanese writing from Latin spelling to be managed, the mechanism of using the program needs to be socialized well, the JawaTeX program resulted from this research gives an opportunity if it is adopted in Javanese linguistic. The concept of the text document split and the established transliteration in this article can be used as a basis to develop other cases. For the next research, the Javanese character split writing in good form still needs to be developed. The Javanese character writing sometimes cannot be justified allignment since the Javanese character writing does not recognize space between words.

The JawaTeX transliteration program can be run text mode (CLI) on Linux and Windows Operating System (or all Operating System that support LaTeX and perl). This program also using web interface can be accessed at address http://jawatex.org to translaterate documents. Using modified Drutex module web based JawaTeX also show capabilty to write Javanese characters inline with Latin characters on HTML pages. Having web based inteface make JawaTeX easier to use by everyone all arount the world using Internet connection.

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Future of Human Security Based on Computational Intelligence Using Palm Vein Technology

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Abstract
This paper discusses the contact less palm vein authentication device that uses blood vessel patterns as a personal identifying factor. The vein information is hard to duplicate since veins are internal to the human Body. This paper presents a review on the palm vein authentication process and its relevance and competence as compared to the contemporary Biometric methods. This authentication technology offers a high level of Accuracy. The importance of biometrics in the current field of Security has been illustrated in this paper. We have also outlined opinions about the utility of biometric authentication systems, comparison between different techniques and their advantages and disadvantage. Its significance is studied in this paper with reference to the banks, E-Voting, point of sale outlets and card/document less security system. Fujitsu plans to further expand applications for this technology by downsizing the sensor and improving the certification speed.

Keywords: infrared rays, pattern, contact less, deoxidized hemoglobin, sensors.

1. Introduction

The prime responsibility of any technological development is to provide a unique and secure identity for citizens, customers or stake holders and it is a major challenge for public and private sector organizations. The
rise of identity theft in the internet age is well documented. Recent figures reported a 40% increase in the number of victims of impersonation during the last one year, when compared with the same period in 2009 . Organizations hold large volumes of personal data and thus entail flawless protection. The pattern of blood veins is unique to every individual human, and same is the case among similar twins also. Palms have a broad and complicated vascular pattern and thus contain plenty of differentiating features for personal identification. It will not vary during the person's lifetime. It is very secure method of authentication because this blood vein pattern lies underneath human skin. This makes it almost impossible for others to read or copy the vein patterns. An Image pattern of a human is captured (Figure 1) by radiating his/her hand with near-infrared rays. The reflection method illuminates the palm using an infrared ray and captures the light given off by the region after diffusion through the palm. The underlying technology of palm-vein biometrics works by extracting the characteristics of veins in the form of a bit image database [1][4]. As veins are internal in the body and encompass a wealth of differentiating features, attempts to forge or duplicate it is extremely difficult, thereby enabling a high level of protection. In addition, the sensor of the palm vein device can only recognize the pattern if the deoxidized hemoglobin is actively flowing within the
individual's veins. In recent years, palm-vein pattern recognition technology is not considered as dangerous as near infrared is a component of natural sunlight and it is also referred to as “vascular recognition. The scale of
a biometric system is driven by whether the purpose such as gait analysis, making them easier of years.

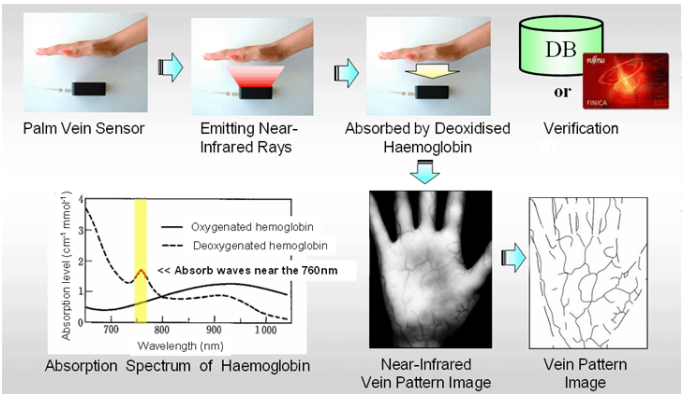

Figure 1 Flow of Palm Vein Technology Process [16].

Biometric template - a numeric representation of several characteristics measured from the captured image, including the proximity and complexity between intervened veins (figure 1). This template is then used to
compare against a user's palm scan each time they undergo authentication process. This technology is non-intrusive i.e. the user need not physically touch the sensor. The users must hold their hand above the sensor for a second. The method is also highly accurate. The International Biometrics Group (IBG), which evaluates all types of biometrics products through comparative testing, found that palm-vein technology was on par with iris scan biometrics in accuracy ratings. Palm-vein recognition technology is notably less costly than iris scanning technology. In fact, the only biometric solution less expensive than palm-vein authentication is fingerprint recognition but it has its own overheads on security feature. For health care organizations, effective palm-vein recognition solutions enable accurate identification of patients, enabling them to quickly retrieve their electronic medical records when they check into respective hospitals. This eliminates the potential human error of accessing the erroneous record, thus

helping in protecting patients from identifying fraudulent attempts. Until now, there has been no biometric technology that can achieve the highest levels of security and usability at a reasonable cost. Palmvein recognition hits that success spot of biometrics between security, cost, accuracy and ease of use that make it an optimal answer and IT enabled control solution for health care organizations and hospitals. Compared with a finger [4] or the back of a hand, a palm has a broader and more complicated vascular pattern and thus contains a wealth of differentiating features for personal identification. The palm is an ideal part of the body for this technology; it normally does not have hair which can be an obstacle for photographing the blood vessel pattern, and it is less susceptible to a change in skin color, unlike a finger or the back of a hand. However research appears to have conquered this challenge and an early demonstration device is built into a computer mouse by Fujitsu in a development of vein pattern identification by researcher Masaki Watanabe. This was used to control access to the computer system. More recently, Fujitsu demonstrated their Contact less Palm Vein Identification System at the annual CeBIT show in March 2005. At least five vendors have been pursuing this technology including Fujitsu, Hitachi, Bionics Co., Identica and Techsphere. Japan's Bank of Tokyo-Mitsubishi made this technology available to customers on 5000 ATM's from October 2004. The biometric template is stored on a multi-purpose smart card that also functions as a credit and debit card and issued to customers. Other Japanese banks are also now introducing this technology. EFTPOS terminals, incorporating palm vein technology are being developed for use in for use in retail stores. While the size of earlier devices limited their use and added to cost, recent developments have reduced the size to make mobile and portable devices feasible. These use 35mm sensors which makes the device small enough to use with laptops and other mobile devices and other office equipment such as copiers [8]. Several of Japan's major
banks have been using palm and finger vein recognition at cash points, rather than PIN, for almost 3 years now and are confirming extraordinarily high standards of accuracy.

2. Principles of Palm Vein Biometrics and Contact less Authentication

The contact less palm vein authentication technology consists of image sensing and software technology. The palm vein sensor (Fig.2) captures an infrared ray image of the user's palm. The lighting of the infrared ray is controlled depending on the illumination around the sensor, and the sensor is able to capture the palm image regardless of the position and movement of the palm. The software then matches the translated vein pattern with the registered pattern, while measuring the position and orientation of the palm by a pattern matching method. In addition, sufficient consideration was given to individuals who are reluctant to come into direct contact with publicly used devices [7] [14]. The deoxidized hemoglobin in the vein vessels absorbs light having a wavelength of about 7.6 x 10-4 mm within the near-infrared area. The device captures an image of vein patterns in wrist, palm, back of the hand, finger or face. This is similar to the technique used to capture retinal patterns. The backs of hands and palms have more complex vascular patterns than fingers and provide more distinct features for pattern matching and authentication. As with other biometric identification approaches, vein patterns are considered to be time invariant and sufficiently distinct to clearly identify an individual. The difficulty is that veins move and flex as blood is pumped around the human body [12]. Human Physiological and behavioral characteristic can be used as a biometric characteristic as long as it satisfies the following requirements:

- Universality: each person should have the characteristic.
- Distinctiveness: any two persons should be sufficiently different in terms of the characteristic.
- Permanence: the characteristic should be sufficiently invariant (with respect to the matching criterion) over a period of time.
- Collectability: the characteristic can be measured quantitatively.

How does Biometrics System Work?

Irrespective of type of biometric scheme is used; all have to go through the same process. The steps of the process are capture, process, and comparison.

- Capture – A biometric scheme is used to capture a behavioral or physiological feature.
- Process – The captured feature is then processed to extract the unique element(s) that corresponds to that certain person
- Comparison – The individual is then enrolled into a system as an authorized user. During this step of the process, the image captured is checked against existing unique elements. This verifies that the element is a newly authorized user. Once everything is done, the element can be used for future comparisons [5].

Certain questions need to be asked when choosing a Biometric System Implementation:

1. What is the level of security is needed?
2. Will the system be attended or unattended?
3. Does your requirement demand resistance to spoofing?
4. What reliability level is required?
5. Should this system be made available throughout the day?
6. Does the system require backups- if yes how many hours of Backup?
7. What is the acceptable time for enrollment?

8. Is privacy to be addressed for your system?
9. What about the storage of the signature?
10. Is the system integrated with Front end and Backend database system?
11. Is the system open for Maintenance activity and tuning around the clock?

In practice, a sensor emits these rays and captures an image based on the reflection from the palm. As the hemoglobin absorbs the rays, it creates a distortion in the reflection light so the sensor can capture an image that accurately records the unique vein patterns in a person's hand. The recorded image is then converted to a mathematically manipulative representation of bits which is highly complicated to get forged or compromised. Based on this feature, the vein authentication device translates the black lines of the infrared ray image as the blood vessel pattern of the palm (Figure 2), and then matches it with the previously registered blood vessel pattern of the individual [9].

2.1 Biometrics Parameters and Keywords Of Palm Vein Technology

- **Vein patterns:** Distinctive and unique to individuals, Difficult to forge
- **False acceptance rate:** A rate at which someone other than the actual person is recognized
- **False rejection rate:** A rate at which the actual person is not recognized accurately
- **Potential is limitless:** Easy to install on personal computer, Reliable , Accurate, Fast, Small
- **Equal Error Rate (EER):** Point where FAR=FRR
- **Failure to Enroll Rate (FTER):** Percentage of failures to enroll of the total number of enrollment attempts.

3. The Working Mechanism/ Implementation behind Palm Vein Biometric

An individual's palm vein image is converted by algorithms into data points, which is then compressed, encrypted, and stored by the software and registered long with the other details in his profile as a reference for future comparison (figure 2). Then, each time a person logs in attempting to gain access by a palm scan to a particular bank account or secured entryway, etc., the newly captured image is likewise processed and compared to the registered one or to the bank of stored files for verification, all in a period of seconds. Implementation of a contact less identification system enables applications in public places or in environments where hygiene standards are required, such as in medical applications. The vein pattern is then verified against a reregistered pattern to authenticate the individual. Numbers and positions of veins and their crossing points are all compared and, depending on verification, the person is either granted or denied access. As veins are internal in the body and have a wealth of differentiating features, attempts to forge an identity are extremely difficult, thereby enabling a high level of security [10]. In addition, the sensor of the palm vein device can only recognize the pattern if the deoxidized hemoglobin is traversing through the veins of the hand which makes the process more secured and safe.

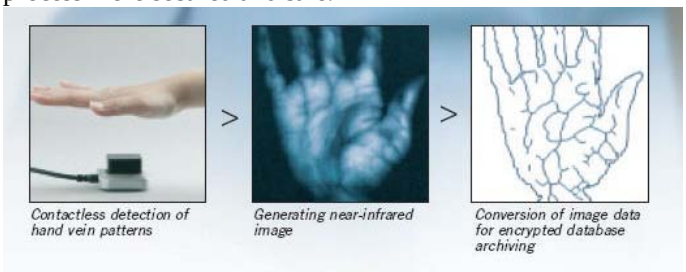

Figure 2. Palm Exposure to Sensor and Conversion/ Comparison against from Archival Database

3.1 Advantages and Disadvantages of Palm vein technology

Advantages	Disadvantages
It does not require user contact	----------
Matching performance is high	----------
Most suitable for authentication	----------
It is accurate , Potential is limitless	Require specialized devices, so can be expensive as of now.
Easy to use or handle	Requires highly active deoxidized hemoglobin.
Unlike fingerprints that change during childhood, the palm vein pattern is established in the womb and is constant throughout a person's life.	---------
It is neither be stolen nor reproduced.	----------

Table: 1 Advantage and Disadvantages of Palm Vein Technology

4. Practical Applications of Palm Vein Biometrics

The rapid growth in the use of e-commerce and online applications requires reliable user identification for effective and secure access control. Palm vein identification has emerged as a promising component of biometrics study. .Applications of palm vein biometrics are: Security systems, Log-in control or network access, Healthcare and medical record verification , electronic record management; Banking

and financial services like access to ATM , kiosks, vault etc. The medical problems like diabetes, hypertension, atherosclerosis, metabolic disorders and tumors are some diseases which affect the vascular systems and are need to be attended very often by the doctor and palm vein technology can come as a bonus facility for faster and accurate medical reading.. In this following section, we present a brief review on the applications and features of applications of palm vein technology useful in the above mentioned sectors.

4.1 Palm Vein for Financial Security Solutions

A rapidly increasing problem among financial sectors in Japan is the illegal withdrawal of bank funds using stolen or skimmed fake bankcards. To address this, palm vein authentication has been utilized for customer confirmation of transactions at bank windows or ATMs. The smart card from the customer's bank account contains the customer's palm vein pattern and the matching software of the palm vein patterns. A palm vein authentication device at the ATM (Figure 3) scans the customer's palm vein pattern and transfers it into the smart card. The customer's palm vein pattern is then matched with the registered vein pattern in the smart card. Since the registered customer's palm vein pattern is not released from the smart card, the security of the customer's vein pattern is preserved. In 2004, the Suruga Bank and the Bank of Tokyo-Mitsubishi in Japan deployed a secured account service utilizing the contactless palm vein authentication system. Several other banks in Japan have followed suit in 2005[13][17]. Fujitsu plans to develop another type of ATM (Figure 3) for use at convenience stores in Japan, embedding the palm vein authentication sensor in the ATM.

Figure 3. ATM with palm vein access control unit pattern authentication sensor unit

4.2 Access Control in House Hold and Business Houses

The palm vein pattern sensor is also used for access control units. The "palm vein authentication access control device" is comprised of the palm vein pattern sensor, a keypad and a small display. This device controls access to rooms or buildings that are for restricted personnel. The device consists of two parts: the palm vein sensor, plus the control unit that executes the authentication processing and sends the unlock instruction [15]. A simple configuration system can be achieved by connecting this device to the electric lock control board or electric locks provided by the manufacturer.

4.3 E-Voting

The physical traits of an individual confirm or verify their identity. This gives rise to ensure citizens e-Voting to br fool proof with no flaws, thus can be employed widely for unique security benefits for identification and security. They can reduce and in some cases eliminate the need for individuals to carry documentation or other physical security measures they might lose or to remember passwords to prove their identification. A more secure future: enabling security through biometrics. Palm vein technology can be a good alternative to world in federal and general election system to figure out undisputed mandate to a winning party. This can introduce much accuracy and reliability dealing millions of voters within hours unlike classical manual methods of franchise votes.

4.4 Nations Border Security Control

Any Border officers have traditional methods by comparing an individual's passport photo to the person. in front of them. Many supporting documents such as entry visas carry no identification other than names, passport numbers, date of birth and addresses etc. Introduction of Biometrics can bring about revolutionary changes in eliminating intrusion into nation's entry. The palm vein technology along with face recognition and fingerprint biometrics can ease identifying

fraudulent and terrorist groups from creeping into other countries.

4.5 Retail Industry

Big retail outlets are making use of biometrics to cater to huge flock of customers and timely delivery of its products and services. This can regulate children age on the purchase of restricted product such as pharmaceuticals, digital products such as alcohol and tobacco etc. If Biometrics is employed in industries along with the ERP systems it can directly address and minimize the commercial and public sector security check burden for dispensing services its products. This can reduce the role of huge server records retrieval and verification at source.

5. Recent technological Developments using Palm Vein Biometric Authentication Sensors

Fujitsu Limited and Fujitsu Frontech Limited [17], Japan has announced that they have developed a PC Login Kit for use with the Palm Secure palm vein biometric authentication device and begun sales of a mouse model
and a standard model for corporate users. Palm Secure PC Login Kit comes standard with login authentication software, enabling client-side authentication and eliminating the need to use an authentication server, which had been required up until now [11]. In addition, other improvements have been incorporated, such as faster authentication speeds without a palm guide and greater tolerance for the distance and angle of the hand when it passes over the device. With the new PalmSecure PC Login Kit, logins to PCs or applications that are in use until now required IDs and passwords can now be done using the highly secure palm vein biometric authentication method. In recent years, as part of efforts to comply with Japan's Personal Information Protection Law and enhanced internal corporate compliance policies, it has become increasingly important to authenticate the identity of people using particular PCs in order to prevent data leaks from PCs that occur because of unauthorized access or identity fraud. Since 2004, Fujitsu and Fujitsu [17] Frontech commercialized the Palm Secure palm vein biometric authentication device, which offers superior security and is easy to use. Since then, the companies have provided the technology to financial institutions and wide array of other industries and organizations for use in various applications, including login to PCs, physical admission into secured areas, management for work time clocks, and library book lending systems. The two companies developed Palm Secure PC Login Kit to make it more simple and economical for customers to deploy Fujitsu's sophisticated palm vein authentication technology. Installing login authentication software as standard-equipped software, sophisticated authentication can be handled by the PC itself, with no need for an authentication server. Palm secure is now widely used in various fields: ATM, 92% of all Japanese ATMs i.e. 18,000 + ATM machines for Bank of Tokyo – Mitsubishi. The mouse model, which is the world's first PC mouse equipped with a palm vein biometric authentication sensor, can easily replace an existing PC mouse, offering convenience and space-saving advantages. The companies have also added a compact and portable standard model to their line of PC login kits for house hold security , user identification and passport verification systems. Both the mouse and standard models are available in black, white and gray to coordinate with different offices and computers. Fujitsu Frontech is in charge of development and manufacturing of the PalmSecure PC Login Kit, with both Fujitsu and Fujitsu Frontech handling sales. Over the next three years, Fujitsu aims to sell 200,000 PalmSecure sensors of all types globally [12][17].

6. Result of experiments

As a result of the Fujitsu research using data from 140,000 palms (70,000 individuals), Fujitsu has confirmed that the FAR is 0.00008% and the FRR is 0.01%, with the following condition: a person must hold the palm over the sensor for three scans during registration, and then only one final scan is permitted to confirm authentication. In addition, the following data has been used to confirm the accuracy of this technology: data from 5-year to 85-year old people of various backgrounds based on statistics from the Ministry of Internal Affairs and Communications of Japan's population distribution; data from foreigners in Japan based on the world population Distribution announced by the U.N.; data of the daily changes of Fujitsu employees tracked over several years; and Data of various human activities such as drinking, bathing, going outside, and waking up. Figure 4 showcases the acceptance and rejection FRR (False Acceptance Rate) and FAR (False Rejection Rate) criteria's mapped with the error rate permissible. Its is very much evident from the table Table 2 how secure and efficient is Palm vein technology over other technologies.

TECHNOLOGY	FALSE ACCEPTANCE RATE	FALSE REJECTION RATE
Palm Secure	.00008%	.01%
Fingerprint	1-2%	3%
Iris	.0001% - .94%	.99% - .2%
Voice	2%	10%

Table:2. Comparison of various Biometric Technologies w.r.t FRR and FAR.

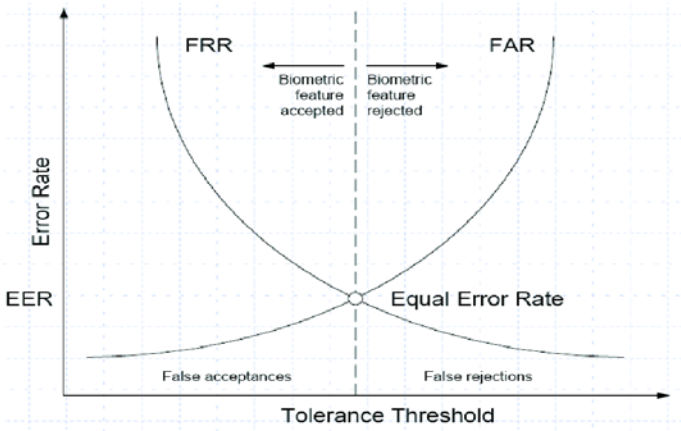

Figure 4. Performance Evaluation

Conclusion

Applications of palm vein biometrics are: a. Security systems: physical admission into secured areas; b.Log-in control: network or PC access; c. Healthcare: ID verification for medical equipment, electronic record management; d. banking and financial services: access to ATM, kiosks, vault. We have already started the work which can be useful for any one of the above mentioned sectors. Biometrics is used for identification purposes and are usually classified as physiological or behavioral. Sometimes a certain biometric can be classified as both. As we continue to progress into the future, more and more biometric schemes will become available. Also, more of the existing biometric schemes will advance further for a higher level of security. Identification and verification classify biometrics even further. The identification process matches 1 to N and the verification process is 1 to 1. As the need for security increases, so will the need for biometrics. It will definitely be interesting to see what the future holds for palm vein biometrics. Palm Vein Technology has presented a new face to the world of security system. It has low FAR and FRR and it has emerged as more hygienic as compared to other systems. In future it can be combined with multimodal biometric system to make the system more attack proof. Thus, we can look forward for an extra ordinary biometric based security systems which would include even passwords along with watermarking authentication algorithms.

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