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A Novel Scheme for Decision Making of Handover in Mobile Wimax

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Abstract: - **Mobile terminals allow users to access service while on the move. This unique feature has driven the rapid growth in the mobile network industry, changing it from a new technology into a massive industry in less than two decades. In this thesis, an in-depth study of the handover effects of mobile WiMAX networks is carried out. The mobile WiMAX technology is first presented as literature study and then the technologies of handovers for previous generations are introduced in detail. Further, the hard handover of the mobile WiMAX is simulated. In addition, the "ping-pang" effect of handover was investigated and the call blocking and dropping probabilities are implemented using MATLAB. The goal is to find out which parameters have the significant impact on the handover performance. The results showed that the threshold and hysteresis margin of the handover should be selected by considering the tradeoff between the "ping-pang" effect and the extra interference causing to neighbouring cells due to the poor quality link. After that some work has been done on the concept of smart handover manager. The main goal of this thesis is to reduce the handover latency. The handover latency of mobile WiMAX is below 50 ms with the traveling speed of mobile station**

Keywords— **Standard wavelet denoising, Baysian Thresholding denoising, Bayes Shrinkage Denoising, BLS Denoising**

I. INTRODUCTION

The growing demand for mobile Internet and wireless multimedia applications has motivated the development of broadband wireless-access systems in recent years. Mobile WiMAX was the first mobile broadband wireless-access solution based on the IEEE 802.16e-2005 standard that enabled convergence of mobile and fixed broadband networks through a common wide-area radio access technology and flexible network architecture. The mobile WiMAX air interface is using orthogonal frequency division multiple access (OFDMA) as the preferred multiple access method in the downlink (DL) and uplink (UL) for improved multipath performance and bandwidth scalability. Depending on the available bandwidth and multi-antenna mode, the next-generation mobile WiMAX will be capable of over the air data transfer rates in excess of 1 Gb/s and support a wide range of high-quality and high capacity IP-based services and applications while maintaining full backward compatibility with the existing mobile WiMAX systems to preserve investments and continuing to support first-generation products. There are distinctive features and advantages such as flexibility and the extensibility of its physical and medium access layer protocols that make mobile WiMAX and its evolution more attractive and more suitable for the realization of ubiquitous mobile Internet access. The next-generation mobile WiMAX will build on the success of the existing WiMAX technology and its time-to-market advantage over other mobile broadband wireless access technologies. In fact, all OFDM-based, mobile broadband access technologies that have been developed lately exploit, enhance and expand fundamental concepts that were originally used in mobile WiMAX. The IEEE 802.16 Working Group [1] focuses on Broadband Wireless Access standards. The current ongoing amendments of Working Group are including six extensions of the IEEE 802.16 as following. The 802.16m is currently in predraft stage and being designed to focus on advanced air interface to meet the cellular layer equipments of International Mobile Telecommunications (IMT)-Advanced next generation mobile networks. It is an amendment to air interface for fixed and mobile broadband wireless access services to push data rates up to 100 Mbps for mobile and 1 Gb/s for fixed while maintaining back ware compatibility with existing WiMAX radios. The 802.11m is designed to fully utilize MIMO technology with OFDMA-based radio system. The 802.16h is in draft stage and being designed to focus on improving coexistence mechanisms for license-exempt operation as an amendment to air interface fixed and mobile broadband wireless access systems. The goal is to ensure that multi-vendor WiMAX systems can be readily deployed in the non-licensed bands with regard to minimum interference to other deployed 802.16 based non-license deployment. The 802.16i is in draft stage and being designed to focus on mobile management information base for MAC, PHY, and associated management procedures. The aim of the standard is to develop protocol independent methodologies for network management formulti-vendor operation. The 802.16j is in draft stage and being designed to focus on providing multi-hop relay specification as an amendment to air interface for fixed and mobile broadband wireless access systems. The standard specifies OFDMA PHY and MAC enhancement to enable the operation of relay stations in licensed bands. The 802.16g is an active standard and being designed to provide conformant 802.16 equipments with procedures and services and to enable interoperable and efficient management of network recourses, mobility. The 802.16f is an active standard and being designed to focus on providing management information base as an amendment to air interface for fixed broadband wireless access systems. The 802.16k is published standard and designed to focus on bridging of 802.16 as media access control bridges for local and metropolitan area networks. Images provide visual representation of the content that is to be examined and allow the users to reflect on them later. They are a powerful data collection medium [1,2] that is stored easily and used indefinitely. With the advent of digital imaging, a whole new set of possibilities have opened up for professional and amateur users. The amateur users can now easily snap, store, edit and share images , while researchers and professional users rely on them to identify areas of interest, scrutinize details and present their findings effectively.

Significance

The aim of this work is that a proper handoff mechanism must be defined to maintain uninterrupted user communication session during his/her movement from one location to another. Handoff mechanism handles subscriber station (SS) switching from one Base Station (BS) to another. Different handoff techniques have been developed. In general, they can be divided into soft handoff and hard handoff. Soft handoff is used in voice-centric cellular networks such as GSM or CDMA. It uses a make-before-break approach whereas a connection to the next BS is established before a SS leaves an ongoing connection to a BS. This technique is suitable to handle voice and other latency-sensitive services such as Internet multiplayer game and video conference. When used for delivering data traffic (such as web browsing and e-mail), soft handoff will result in lower spectral efficiency because this type of traffic is bursty and does not require continues handover from one BS to another. Hard handoff (HHO) is used in Mobile WiMAX. In hard handoff, a connection with a BS is ended first before a SS switches to another BS. This is known as a break-before-make approach. Hard handoff is more bandwidth-efficient than soft handoff, but it causes longer delay. A network-optimized hard handoff mechanism was developed for Mobile WiMAX to keep a handoff delay under 50 ms. another is the lack of proper handover management system. There are certain steps which are involved in handover process.

- Service evaluation and handoff initiation.
- Network condition detection and handoff decision.
- Handoff execution

In Heterogeneous wireless network environment, vertical handoff processes caused by the movement of users are inevitable .Hence it creates problem when ms enters from one technology from another.

1.4 Objectives and Aim of this Research

The goals of this research involve several aspects of the handover in the mobile WiMAX.

- The handover technologies in cellular networks from both foundational and advanced aspects, such as the types of handovers, the handover decision, and handover optimization, etc.
- Understand the underlying technologies in the WiMAX network in terms of physical layer and MAC layer, and some advanced topics, for example,
- Multi-Input Multi-output (MIMO) and beam forming are introduced.
- Analyse the strength-based handover and signal-to-interference-based handover using MATLAB. In addition, the call blocking and dropping probabilities in the handover are studied. Furthermore, the impact of the speed of mobile station onthe handover latency for the mobile WiMAX has been investigated..

Available Bandwidth Estimation

By the OFDMA technique, the bandwidth is allocated in the form of data bursts where an integer number of slots are included. The BS determines the number of DL and UL slots that a station obtains in one frame, and then broadcasts the resource allocation results through DLMAP and UL-MAP messages at the beginning of each DL subframe. Therefore, the station can easily obtain the utilization of WiMAX link by aggregating the number of allocated slots stated in DL-MAP/UL-MAP messages. Let *AASd* and *AASu* denote the number of allocated DL/UL slots in one frame, which are averaged from frames. *Tf*, *Tdf* and *Tuf* denote the duration of a frame, a DL subframe and an UL subframe, respectively. Then the available bandwidth in DL and UL can be calculated

$$B\ (downlink)=(1-AASd/Sd)*TdfSd/Tf$$
$$B\ (uplink)=(1-AASu/Su)*TufSd/Tf$$

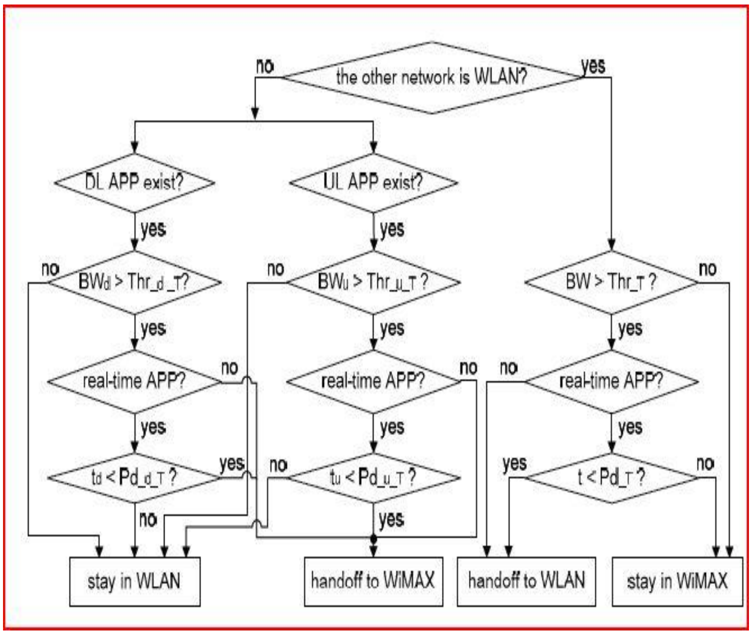


Fig. Handover decision making for mobile wimax

1 Simulation for Path loss

To check the handover performance, we have to check the response of the path loss and the received power signal of the mobile node when it moves from one base site to another.

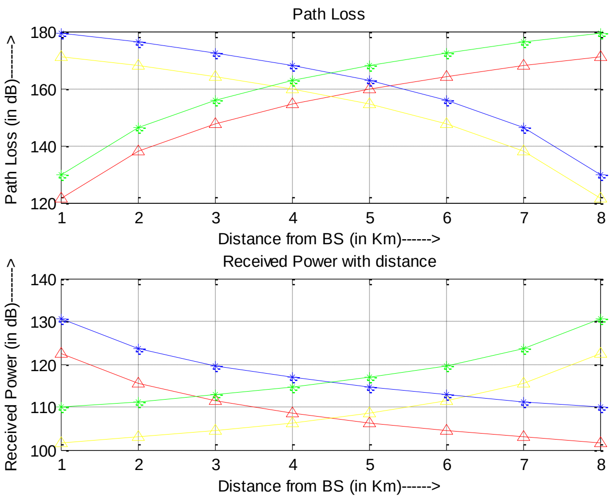


Fig. Path loss and Received power of mobile node.

Simulation for Dynamic Hysteresis

We have designed a simulation system which consists of two base stations and a mobile node which is moving from one base site to another. The value which are taken are generally, for frequency we use value nominal for more than 30 Mhz. after that the height of the base site is mentioned .the base site is mainly of height from 25 metres to 60 metres after that the height of the mobile node is given. Then we have to specify the area for which the simulation has been done. It can be urban area, semi-urban and the large city. The figure represents that as the mobile node moves, the path loss increases and the received signal strength decreases. Upto a particular threshold level the handover should take place, unless the call will be dropped or the connection is lost.

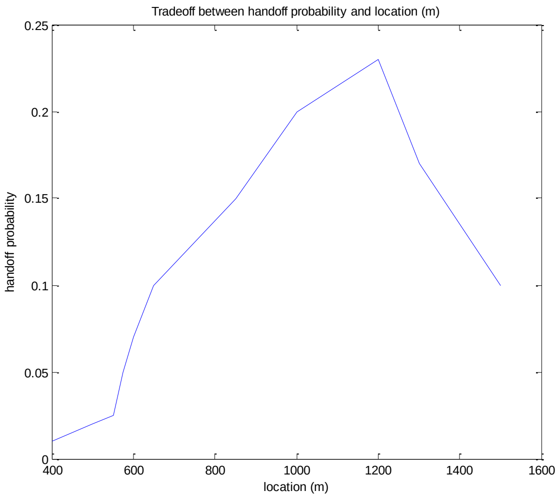


Fig. Tradeoff between handoff probability and location (m**)**

Fig. shows the probability of handoff when the MS moves away from the serving BS along a straight line from the serving BS to an adjacent BS. Our scheme shows the best performance, because the handoff probability of our scheme is the smallest when the distance is less than 800m, and it increases fastest from 0 to 1 in the handoff area near the cell boundary. Therefore, our scheme has the smallest handoff area, i.e., our scheme achieves the best handoff area. The handover should take place 1100 m .After that the handover probability decreases as the distance increases further.

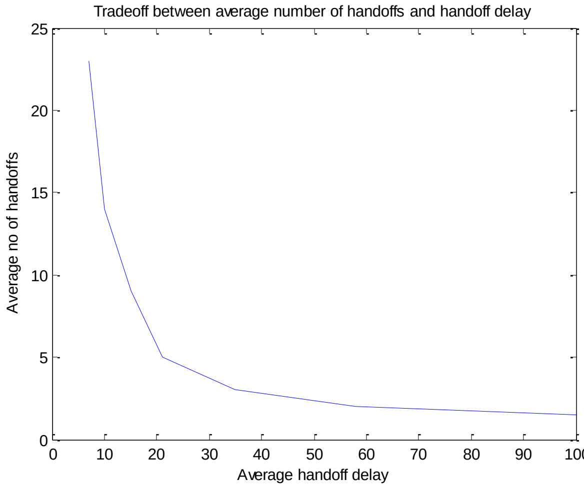


Fig response of average number of handoff with handoff delay

As the hysteresis value increases, the figure of handoff probability shifts to the right, which means the increase of handoff delay. And the figure becomes more centralized with the increasing of the hysteresis value, resulting in the decease of the handoff area. As the handover delay increases the handover probability decreases. Hence we set the nominal value of 50 ms.

After that the response of the average no. of handover with the hysteresis value. The observations can be seen:-

- As we keep the value of the hysteresis margin low, then the average no. Of handover increases. Which cause the unnecessary handovers and increase the systemload.
- If we use the large value for h, then the average no. Of handoffs will decrease but the handover delay will be more.
- But if we use the adaptive value for h. According to the distance then the no. Of handoffs are constant.

Average number of handoffs and standard deviation of handoff location decrease with increasing hysteresis value h, average handoff delay and probability of link degradation increase as h increases. It can intelligently reduce the probability of unnecessary handoffs and maintain the quality of service. Analytical and simulation results show that the proposed scheme performs better than other schemes with static hysteresis value in terms of the average number of handoffs, average handoff delay, standard deviation of handoff location, and probability of link degradation.

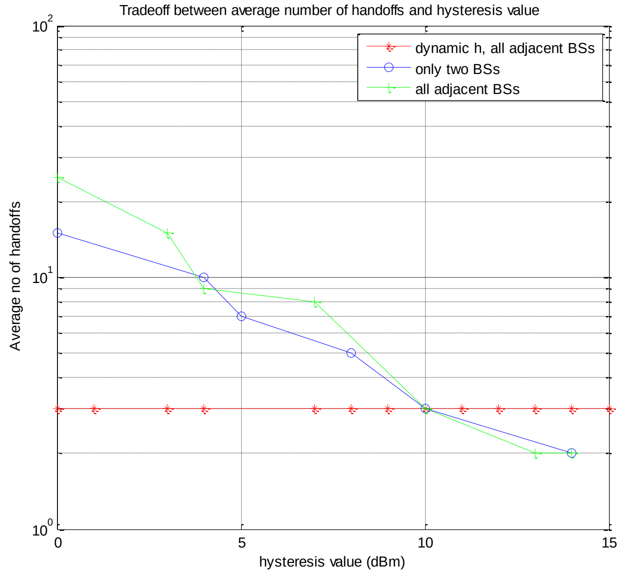


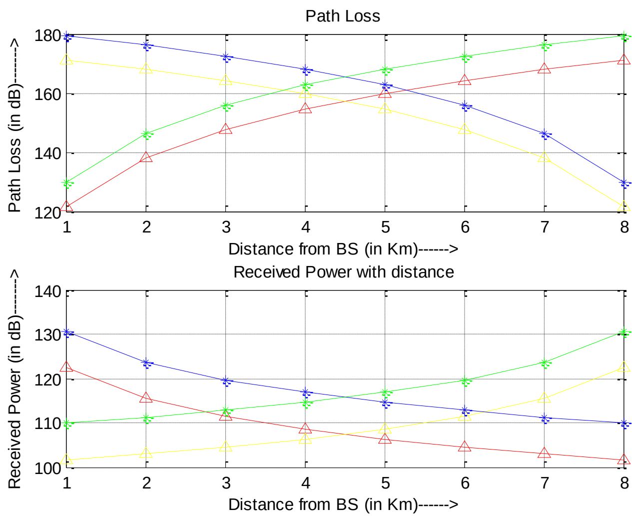
Fig Average no. Of handoff with hysteresis value

II. RESULTS AND DISCUSSIONS

The goal for simulation is to test the performance of handover in PHY layer and the properties of mobile WiMAX in practice. In this chapter, we first implement the handover concept using MATLAB and later on a very basic scheme is planned for the decision making for the handover with different algorithms. We have done the simulation in different steps. Firstly we have to make the environment for the handover simulation.

Simulation for Path loss

To check the handover performance, we have to check the response of the path loss and the received power signal of the mobile node when it moves from one base site to another. We have designed a simulation system which consists of two base stations and a mobile node which is moving from one base site to another. The value which are taken are generally, for frequency we use value nominal for more than 30 Mhz. after that the height of the base site is mentioned



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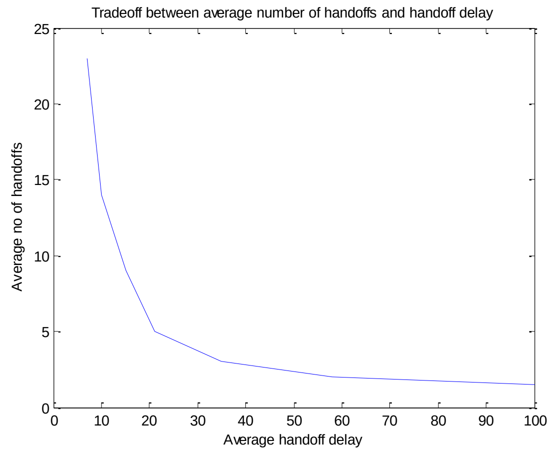

Response of average number of handoff with handoff delay

As the hysteresis value increases, the figure of handoff probability shifts to the right, which means the increase of handoff delay. And the figure becomes more centralized with the increasing of the hysteresis value, resulting in the decease of the handoff area. As the handover delay increases the handover probability decreases. Hence we set the nominal value of 50 ms. after that the response of the average no.of handover with the hysteresis value. The observations can be seen:-

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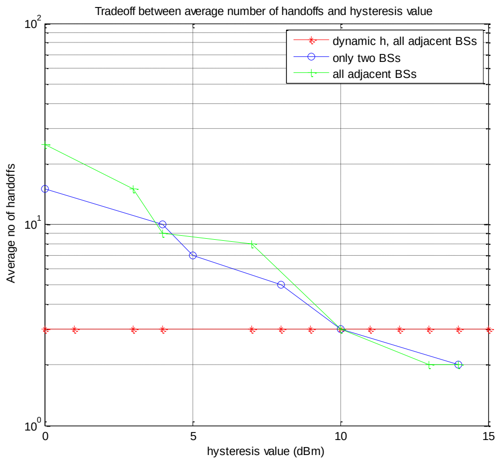

Average no. Of handoff with hysteresis value

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