ISSN 2321-743X
International Journal of Research in
Engineering and Bioscience
Volume 2 (Issue 4) Pages (184-192)
IJREB
Journal home page: www.ijreb.org

SURVEY ON DIFFERENT TYPES OF HANDOFF IN WIRELESS COMMUNICATION SYSTEMS

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ABSTRACT

Nowadays Wireless communication is playing an important role in our daily life, since it offers flexibility and mobility. The rapid development of wireless communication systems, several wireless technologies have been implemented for MIMO enabled systems ,The new multimedia services demand data-rates of up to hundreds of Mbps and thus higher frequency bands are being explored to support these new high data rate services. However, to support mobility, handoff is a must in many of these networks an systems. The high reduction in signal strength as a function of distance results in a small coverage area, thereby causing frequent handoffs for mobile terminals. Most existing WLAN-based communication systems use traditional IEEE 802.11 technologies, such as 802.11a/b/g. When a mobile station moves between successive WLAN accesses points (APs), a handoff procedure occurs. The traditional WLANs were not originally designed for high-speed environments with frequent handoffs, this handoff process may result in communication interrupt and long latency of up to several hundreds milliseconds In this paper gives a survey of Hand off latency improvement in MIMO enabled wireless communication system also compare the latency of different hand off latency algorithms intended for WLAN - MIMO communication networks.

KEYWORDS: Handoff, Forced Termination Probability, Handoff Performance Metrics, Resource Management, Handoff Prioritization Scheme

IJREB

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Engineering and Bioscience

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INTRODUCTION

Wireless communication play an important role in the modern world because of its mobility and flexibility with more than 3.7 billion users now and a hundredfold increase of traffic expected by the year 2013 [1]. In the future, the home and office networking environments are predicted to be dominated by a variety of multimedia services like wireless HDTV, wireless home entertainment and virtual wireless office [2]. In order to support these applications, the wireless network should provide the user with transmission capacity of hundreds of Mbps using short-range Gbps wireless technology and using techniques like antenna diversity, sophisticated coding schemes, etc. With 5 GHz of unlicensed spectrum available at 60 GHz band, it is an obvious candidate for the PHY layer of future home networks. Handoff is an important aspect in wireless and cellular communication due to the mobility of devices. It is the process that allows a user to move around while keeping an ongoing call or session on a terminal. It does so by changing its current channel in the current cell to a new channel in either the same cell or in a different cell [3]. Handoff is usually transparent to the user, but it directly affects the quality of service. A lot of research has been done on handoffs in cellular networks and WLAN. However, little work has been done on handoff in High frequency systems.

Two types of handoffs are distinguished: horizontal handoff and vertical handoff. Horizontal handoff occurs when a mobile station (MS) is moving out of the coverage of a base station (BS) into the coverage of another BS within the same system. Vertical handoff is defined as handoff between BSs that use different wireless networking technologies, e.g., WLAN to and from cellular wireless networks. This paper introduces the currently used handoff algorithms and discusses handoff issues in the 60 GHz band. Before we address the 60 GHz-specific issues, we compare the handoff algorithms that are proposed and implemented in the wireless and cellular systems. Handoff has become an essential criterion in mobile communication system especially in urban areas, owing to the limited coverage area of Access Points (AP). Whenever a MN move from current AP to a new AP it requires handoff. For successful implementation of seamless Voice over IP communications, the handoff latency should not exceed 50ms. But measurements indicate MAC layer handoff

IJREB

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latencies in the range of 400ms which is completely unacceptable and thus must be reduced for wireless networking to fulfil its potential. With the advent of real time applications, the latency and packet loss caused by mobility became an important issue in Mobile Networks. The most relevant topic of discussion is to reduce the IEEE 802.11 link-layer handoff latency. IEEE 802.11 MAC specification [1] defines two operation modes: ad hoc and infrastructure mode. In the ad hoc mode, two or more stations (STAs) recognize each other through beacons and hence establish a peer-to-peer relationship. In infrastructure mode, an AP provides network connectivity to its associated STAs to form a Basic Service Set (BSS). Multiple APs form an Extended Service Set (ESS) that constructs the same wireless networks.

TYPES OF HANDOFF

Handoffs can be classified based on several factors, like the type of the network, the involved network elements or the number of active connections and the type of traffic that the network supports. The different types of handoffs are depicted. A hard handoff is one in which the channel in the source cell is released and only then the channel in the target cell is engaged. Thus the connection to the source is broken before or 'as' the connection to the target is made—for this reason such handovers are also known as break-before-make. When mobile is between base stations, then mobile can switch with any of base stations. So, base station bounces the link with mobile back and forth. This is called ping-ponging.

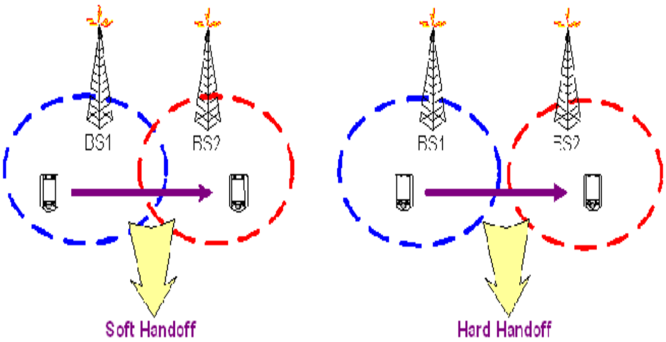

Fig 1.Soft and hard handoff

A soft handoff is one in which the channel in the source cell I retained and used for a while in parallel with the channel in the target cell. In this case the connection to the target is established before the connection to the source is broken, hence this handovers is called make-before-break. Soft handovers may involve using connections to more than two cell,. e.g. connections to three, four or more cells can be maintained by one phone at the same time. The latter is more advantageous, and when such combining is performed both in

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the downlink (forward link) and the uplink (reverse link) the handover is termed as softer. Softer handovers are possible when the cells involved in the handovers have a single cell site.

HAND OFF PROCEDURE

In WLAN Mobile-ground communication systems, the mobile station can move at high speed. The received SNR from two successive APs measured by field tests. As we can observe from the figure, the received SNRs rapidly changes when the mobile station moves from one AP to another, which is mostly due to the changing path loss, Doppler spreads, shadowing, and antenna radiation patterns.

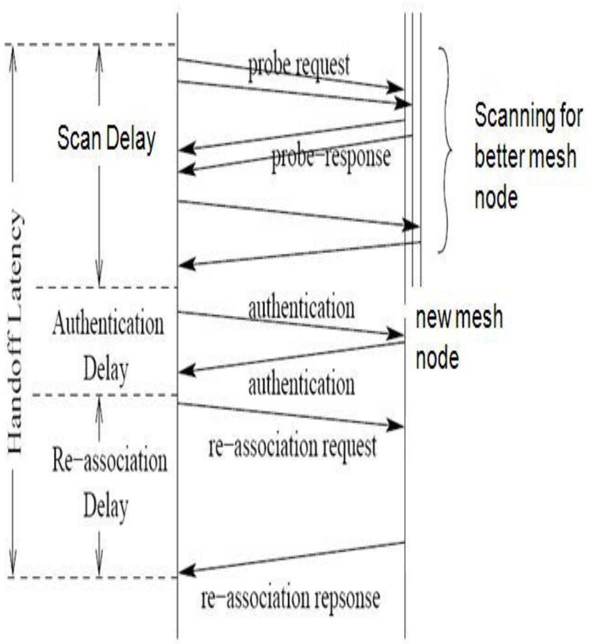

Fig.1.Hand off procedure

The handoff procedure can be divided into three steps,1. probing (also referred to as scanning), 2.authentication, 3. reassociation. Six packets are transmitted between the mobile station and AP before the handoff ends, and the average time needed to finish the handoff is approximately 6(T average)+6(Tprocess)which is the communication latency ,T(process) is the processing time in the AP and Mobile station before they send new packets.

HAND OFF LATENCY IMPROVING ALGORITHMS

Based on the handoff criteria, handoff algorithms can be classified into two classes

i) Conventional handoff algorithms – these algorithms are based on the signal strength, distance, velocity, power budget, and SIR.

ii) Intelligent handoff algorithms – these are based on AI technologies such as fuzzy logic, prediction, pattern cognition, and neural networks.

a) Relative Signal Strength (RSS), Hand Of Latency Algorithm

In This method to find the different received signal strength threshold value for handoff and also a proper scheme of handoff between neighboring cells in the Cellular

IJREB

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Network (CN) , between cellular Wireless Local Area Network(WLAN) and cellular network and vice versa between High Performance Radio LAN (HIPERLAN) and cellular network and vice-versa. Received signal strength is a measure of the power present in a received radio signal. It determines the connectivity between a Mobile Terminal (MT) and Base Station(BS) or Access Point(AP).The Received Signal Strength(RSS) should be strong enough between BS/ AP and MT to maintain proper signal quality at the receiver. RSS gets weaker as a MT moves away from a BS/AP and the opposite happens when the MT moves closer to the BS/AP. So as MT goes away from the current BS/AP it is connected to handoff becomes necessary with its neighboring BS of CN or AP of WLAN. The RSS threshold value for handoff between different networks will be calculated in this section using formula of RSS for different networks.

The threshold value of RSS depends on a few factors:

1. The velocity of the MT.
2. The latency of the handoff process.
3. The type of network the MT is presently in and the type of network with which the MT is trying to initiate handoff.
4. The size of the CN/WLAN cell the MT is presently residing. If the same threshold value of RSS is used irrespective of the handoff scenario then that will increase the probability of false handoff initiation which increases unwanted traffic resulting in the blocking of other calls. Also it will increase the probability of handoff failure resulting in dropping of ongoing calls. So a different threshold value of RSS is used depending on the scenario of handoff.

b) Velocity Based Algorithms.

In method a handoff management protocol to support seamless handoff in Next Generation Wireless Systems. We consider the mobile node's speed, Relative Signal Strength of the base station, handoff signaling delay information and threshold distance from cell boundary to reduce false handoff initiation probability which creates unnecessary traffic load and sometimes call blocking. Here consider the coverage area of the base stations (BS) as regular hexagonal cells. We take two base stations into our account to explain our proposed approach, one is OBS where the call generates and other is NBS, next destination of the MN. When the MN tends to move out the

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coverage area of OBS it needs handoff with NBS to continue the call.

c) Fuzzy logic based handoff algorithms

In this algorithm states that the adaptive fuzzy logic based HO algorithm for HNs is presented..In this algorithm MT speed and traffic in the WLAN are used as input parameters. We assumed that MT speed can be estimated. In this methods for estimating the speed of MT, which are based on doppler frequenc. Also this algorithm, averaging window is adapted according to MT speed. When MT speed is high the window will be reduced, so the HO delay is decreased and when the MT speed is low averaging window will be increased, so unnecessary HOs are avoided. Handoff initiation mechanism and cell selection mechanism are the same as before. Handoff decision mechanism is similar to previous algorithms, the only difference is that, here HYSm and HYSw values are updated by a fuzzy logic system (FLS). Inputs of the FLS are MT speed and traffic in the "W" (TRw). The FLS is designed to meet special requirements of HNs. When the velocity of the MT is high or the traffic in the WLAN is heavy, HO to WLAN should be discouraged; otherwise HO to WLAN should be encouraged. The FLS increases HYSm and decreases HYSw when HO to WLAN must be discouraged and HO to macrocell be encouraged and it decreases HYSm and increases HYSw when HO to macrocell should be discouraged and HO to WLAN be encouraged. Fig. 6 to 9 illustrates the membership functions of the input and output fuzzy variables. The fuzzy variable "speed" has five fuzzy sets (Slowest, Slow, Normal, Fast, Fastest) and fuzzy variable "TRw" has three fuzzy sets (Low, Normal, High). Output fuzzy variables "HYSm" and "HYSw" have five fuzzy sets (Lowest, Low, Normal, High, and Highest). It should be noted that modifying the membership functions will change the sensitivity of FLS output to its inputs. Also increasing the number of fuzzy sets of the variables will provide better sensitivity control but also increases computational complexity of the system.

D) Prediction Based Algorithms.

In this method that is the Support vector theory, which is able to overcome the limited generalization ability due to over-fitting in traditional learning theory, has the unique and globally-optimal solution. Based on support vector machine, support vector regression (SVR) can obtain high prediction accuracy for

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a small number of samples without local minima by introducing insensitive loss function. As a result, SVR is widely applied to linear and nonlinear predictions Local prediction is presented relative to global prediction that it means only local information adjacent to the predicted point is used to predict trajectory. On one hand, local prediction can save storage space and improve computational speed. On the other hand, compared with only one global function used, to fit trajectory using multiple local functions can obtain higher prediction accuracy [20].

The basic idea of LSVR mobility prediction algorithm proposed in this paper lies in LSVR applied to trajectory prediction that LSVR algorithm regards trajectory of mobile user as a function on X-Y plain and locally fits the trajectory using SVR. Then, the cell that the user will enter can be determined according to the topology of coverage. At present, it draws much attention that local prediction combined with SVR achieves high prediction accuracy for non-linear prediction problems

E) Neural Network Based Handoff Algorithms

The neural network based approach suggests neural encoding of the fuzzy logic systems to simultaneously achieve the goals of high performance and reduced complexity. Here the training input is given to the network for tajing the hand off in right time with out getting any delay so the latency has been reduced this technique is very much capacity of reduce the latency compared to the other methods.

Comparison of Different Algorithms And Their Performances

We use the simulation for different algorithm in MATLAB 2013a the latency has been changed for each algorithm it shown in the graphical data below

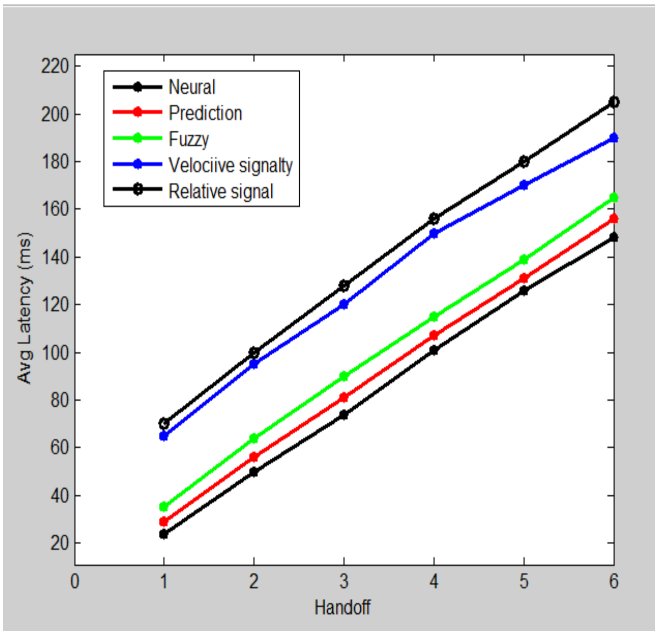

Fig.2. Latency Comparison of different algorithms

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All these policies' performance significantly decreases with the increase in channel estimation error. This is because an accurate channel state is difficult to obtain when the channel estimation error increases. A higher channel estimation error rate increases the probability of observing a wrong channel state and the probability of making a wrong handoff decision when the wrong decision occur the latency also increases to avoid that we are using this neural network algorithm

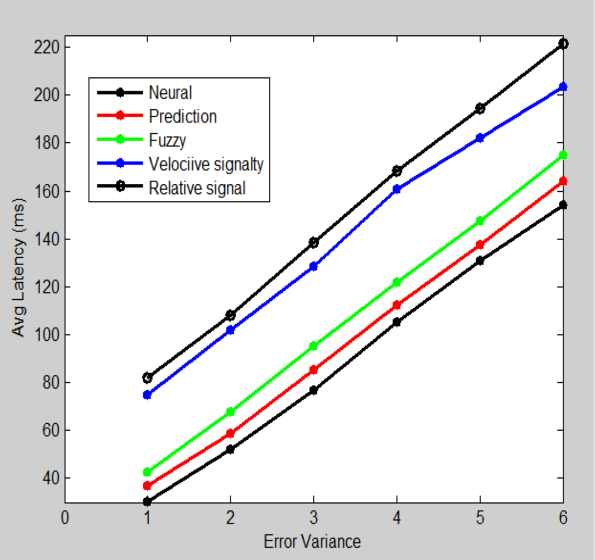

Fig.3. Comparison of Latency vs observation error of different algorithms

CONCLUSION

We first gave an overview of the handoff algorithms in cellular and wireless network. Then. We observe more number of handoffs and lesser time for carrying out a handoff. The handoff is an important aspect in such indoor network. The performance of the above mentioned all algorithm shows the different delay for often hand off even though the neural network based hand off algorithm giving he optimal performance that is the latency will be reduced compared to other methods

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