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Review Article

ADVANCE SEAMLESS HANDOVER TECHNIQUE IN LTE NETWORK: A REVIEW

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The rapid improvement of the mobile generations was for the purpose of supporting as many mobile devices as possible that could benefit the users at anytime and anywhere in terms of common practical applications such as internet access, video-on-demand, video conferencing system and many more applications. Wireless communication is facing the fastest revolutionary changes in technology. The control plane 4G speeds are meant to exceed that of 3G. Current 3G speeds have an upper cap at 14 Mbps downlink and 5.8Mbps uplink. If we achieve the speed of up to 100 Mbps for a moving user and 1 Gbps for stationary user is reached, it is classified as 4G technology. Seamless roaming and mobility management are the foremost challenges before heterogeneous 4G wireless networks. The 4G communication is aimed at making the user to freely, seamlessly roam across various networks and to provide connectivity to any wired or wireless systems. We propose the GPA method to be developed on the three layered platform to provide a simple architecture which performs both type of handovers considering wider range of factors for decision making

Keywords: Generic algorithm, Quantitative decision, Vertical handover, Fourth generation

INTRODUCTION

In the terms of mobility, the network ensures a seamless connection for example in case of fourth generation wireless networks. Handover is a term which is most popular in cellular communication which means when a user continues with its call when he/she switches from one coverage zone to another.

TYPES OF HANDOVER

1. **Horizontal handover:** To switch from one coverage zone to another the user uses same access technology.
2. **Vertical handover:** To switch from one coverage zone to another the user uses different access technologies.

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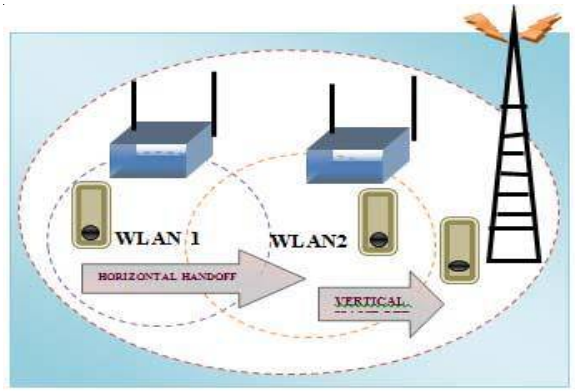
Three phases of handover process:

1. **Handover information gathering** – All the information is collected which is required for the handover process to take place
2. **Handover decision** – In the decision part we are using the algorithm.
3. **Handover execution** – It is used to change the channels with respect to the details required during decision phase.

Figure 1: Vertical Handover Vs Horizontal Handover



To have seamless communication between the heterogenous wireless networks vertical handover is used as it supports multiple features:

- Access technology changed in case of vertical handover.
- It supports number of parameters.
- Network interface is changed
- Different IP are used

RELATED WORK

In order to make possible a seamless access in multi-access wireless networks, designing an efficient vertical handover (VHO) algorithm is always considered critical. Different schemes such as fuzzy logic, neural network and neuro-fuzzy systems are sought to resolve VHO algorithms problems. An adaptive fuzzy based vertical handover algorithm using fuzzy logic system was proffered in deciding the handover, where the hysteresis values of RSS traffic load and user speed were taken into account . The VHO decision mechanism considered only the RSS as the input parameter. RSS and service type were combined to optimize the VHO decision mechanism as spelt out in. Consequently, the fuzzy logic system was considered when selecting cells while the RSS threshold for the VHO decision remain unperturbed, thereby aggravating the effect of Ping-Pong. In a multi-criteria decision-making algorithm that depends on fuzzy theory for access network selection was suggested. However, only the theoretical aspects of the network mobility were highlighted. A neuro-fuzzy predictor was co-opted in predicting RSS in LTE-Advanced and WLAN networks. As a result of fuzzy predictor, fuzzy inference mechanism was proposed to decide whether it is possible to handover conforming to fuzzy decision algorithm. Additionally, the complex nature of the system needs to be resolved prior to its wider utilization. A novel Fuzzy logic VHO algorithm scheme using differential prediction and pre-decision methods was employed to excite a VHO trigger in. The target network selection is achieved using a normalized quantitative decision value and not considering the enumerative fuzzy rule base .However, for the differential pr**e**diction part, it could not be so precise because of degradation. Thus, BW and RSS have fallen

short as inputs to the system for possible VHO decision. The theory of generic prediction could be implemented to determine the next RSS values under a lognormal fading environment.

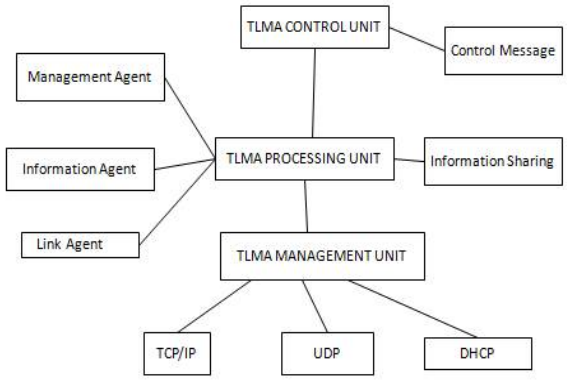
In the other hand we also consider a another techniques for vertical handover.All the available wireless technologies have handover mechanism for horizontal hand off. To provide vertical hand off different solutions are proposed. In TCP/IP protocol suite implementation of MSOCKS or TCP-migrate provides vertical handoff. But these methods require changes in existing TCP .Most of the mobility solutions are mobile IP based. To support seamless mobility IPV4 or IPV6 requires additional entities in the network. Also IP based methods cannot provide users specific handovers. Mobility from one terminal to the other needs support of higher level layers. Network layer should rely on session layer for resolving these issues. SLM Session layer based mobility management solution provides a architecture to handle vertical hand over. SLM uses user location server (ULS) in the network .It does not have facilities to use the latest mobile independent handover (MIH) mechanism provide by wireless LAN technologies. Session initiation protocol (SIP) is the other method provides mobility based on location updates. But it still has interoperability issues. It also requires proxy servers and registrars.

PROPOSED WORK

The proposed TLMA architecture mainly utilizes the intelligence of end user mobiles for its frame work. This ensures the use of existing TCP implementations without any change. TLMA provides support for user specific handover which is not provided by TCP. It facilitates TCP rather than changing it. The difficulties of location management are reduced. Figure 4 shows the architecture of TLMA.

- M. Gopu, Dr. Ritesh Khanna presents three layer architecture to provide seamless roaming and user specific handoff without altering the current implementations.
- It also avoids the need for new entities.
- The first layer is a management agent and the next is information transfer.
- The final layer behaves as link agent.
- Management agent controls and shares the messages among different access networks. Information agent handles data streams.
- Link agent gathers details about the connected links and provides status updates.

Figure 2: TLMA Architecture



- The proposed TLMA architecture mainly utilizes the intelligence of end user mobiles for its framework. This ensures the use of

existing TCP implementation without any change.

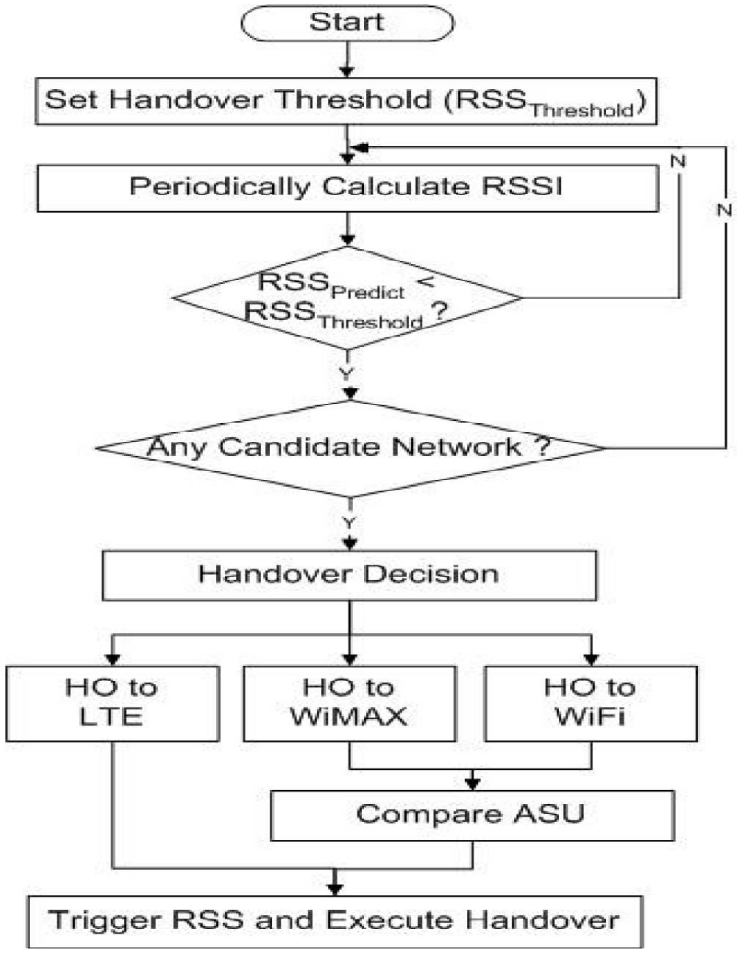
- A.M. Miyim et. al,in an effort to reduce the data loss probability, proposed the Generic Prediction Algorithm (GPA), which adopted specimens of received signal strength (RSS) as augment to compute the predictive received signal strength. Received signal strength(RSS), bandwidth (BW), and service cost (SC) were three QoS metrics considered as input parameters for Quantitative Decision Algorithm (QDA) of the divergent networks.
- The comparison of values of QDA of the networks was made to improve the vertical handover decision.
- A result of simulation showed that the algorithm proposed produced a better network performance in terms of link reliability. The algorithm(GPQDA) comprised of Grey (GP) prediction technique and Fuzzy decision system (FDS).
- The technique was used to predict the RSSI and PoA to monitor the inputs of fuzzy decision system as essential steps in predicting the target network for a handover. Thus, FDS computed the RSSI of individual networks and compared with the handover threshold values to make the decision for handover.

Seamless roaming and mobility can be provided by utilizing the intelligence of the network or the sophisticated end equipment i.e. user mobiles. By this, we can ensure use of existing TCP implementations without using them. The methodology which combines the work done by A.M. Miyim and Gopu & Khanna is explained as under:

- We here present a modification of work done by A.M. Miyim , who created a generic prediction algorithm to predict the RSS value.
- The three layer architecture created in , presents a very simplified way to carry on the handover. The scheme provides method to perform both user specific handover as well as automatic handover. Automatic handover initiation occurs when the user moves away from the excising access network. In the other way the user purposefully can force a handoff according to his preferences.
- The method adopted by Gopu and Khana works only according to the RSS value but the proposed technique covers other factors like bandwidth and service cost to decide the handover.
- The concept framed above by combining the three layered architecture proposed by Gopu and Khana and the research work by Miyim is implemented using MATLAB 2009. The three layers perform their functionality in exactly the same way but the factors considered for handover are not limited to RSS value.

We propose the handover technique to be developed on the three layered platform to provide a simple architecture which performs both type of handovers considering wider range of factors for decision making.

Figure 3: Proposed GPA-Based Quantitative Decision Algorithm (GPQDA)



This proposed approach is the decision makin stage of the GPQDA. It is built on a method that evolves the effect of hysteresis to reduce the delayed handover. The proposed prediction algorithm comprises of network QoSmonitoring, which decides the possibility of handover triggering and network selection to choose the appropriate access network.

Herein, consideration is given to a heterogeneous network consisting of three overlayed networks.

While two radio base stations (RBSs), RBS1 and RBS2, standing apart by a distance *d* covers for the LTE-A networks, the WLAN (WiMAX & Wi-Fi) are being covered by APs and having one mobile user (UE) roaming. A phenomenon known as the Manhattan corner effect based on non-line-of-sight transmission scheme, influences a UE on turning a street comer to drop 20-30 dB received signal level Figure 1 illustrates the flow chart of the proposed GPQDA.

B. Simulation Result

The results of the proposed algorithm (GPAVHO) for the number of HO under different conditions are presented here in

Figure 5. Three values of RSSI (LTE, WiMAX and Wi-Fi) of the mobile station are being monitored for duration of 360 seconds simulation time. The proposed algorithm (GP-VHO) in Figure 6 is compared with two other known schemes: basic fuzzy logic VHO (BF-VHO) and that of differential prediction VHO (DPVHO) where less number of handovers was recorded in the GP-VHO when compared with the ones recorded by the other two VHO. This was as a result of the dynamism of the weights of themultitude metrics as well as the precision of the new proposed GPA prediction. It is therefore worth mentioning, that the GPA-VHO is hardly affected by the UE velocity, as the proposed algorithm is able to predict handover at high mobility in fast fading environment.

Figure 4: RSSI of WiMAX, LTE and WiFi (= 1 to 360 s)

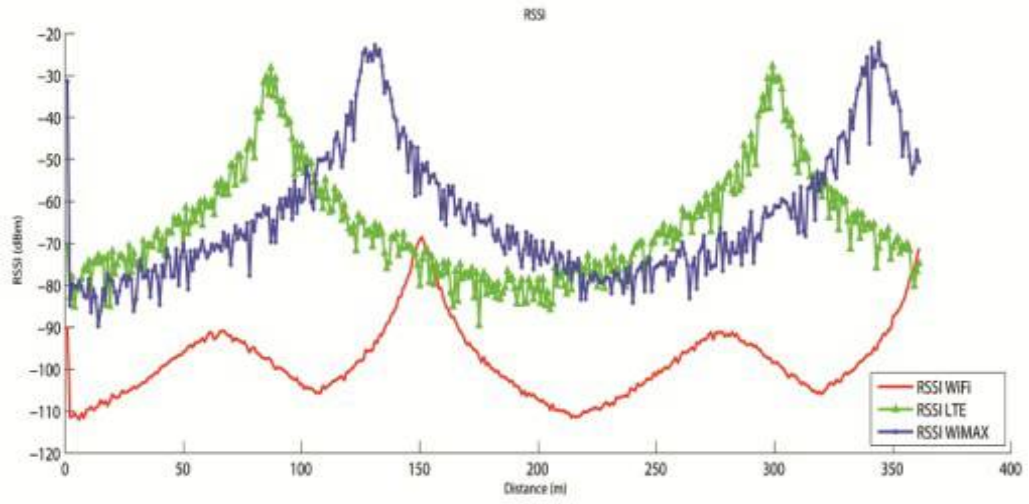
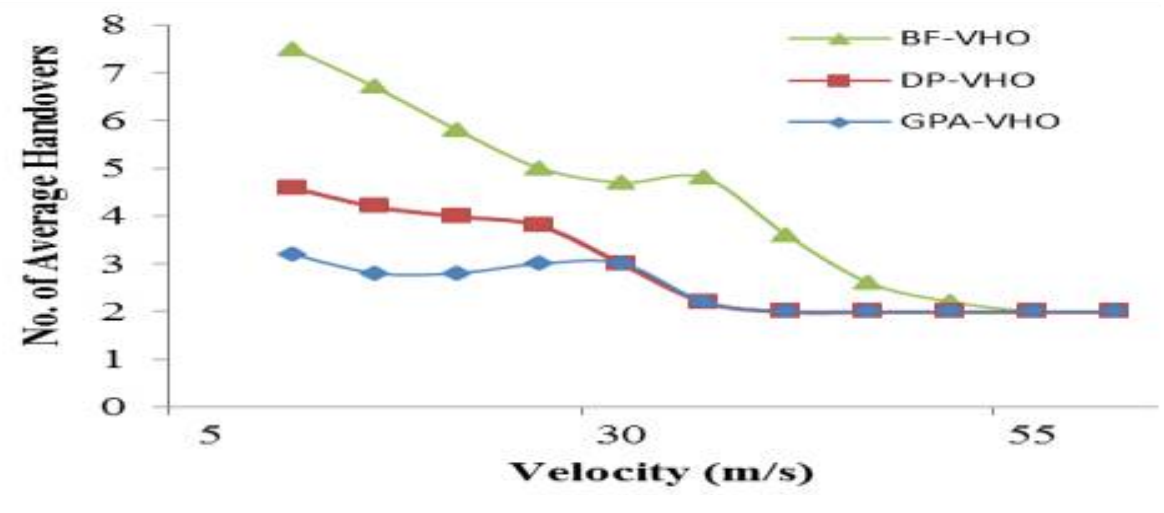


Figure 5: Average Number of Handover Vs. Velocity



CONCLUSION

As the cell size decreases for achieving higher capacity in a cellular network, devising suitable handoff algorithms to reduce both mean number of handoff and handoff delay is motivated. However, minimizing both of these parameters, by means of traditional handoff algorithms based on averaging interval, simultaneously seems impossible. Here we showed that applying powerful grey prediction technique proposed in the literature helps to minimize both the mean number of handoffs and handoff delay. This fact causes the communication society to pay special attention to grey prediction theory for the application of handoff algorithm in fourth generation mobile systems.

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