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Comparative Analysis of Vertical Handover Algorithms

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Abstract

The future wireless network comprises of a few heterogeneous systems and the QoS of these systems relies upon different parameters like system limit, transmission capacity, information rate, Received Signal Strength (RSS), control utilization and so forth. For the continuous progressing calls regardless of the home area or guest area registry, Handoff (Handover) is required to guarantee the progressing client session with consistent availability. Many fascinating examination challenges are completed by various analysts in the field of handoff. A decent handoff ought to stay away from or decrease call drops with least assets and power utilization. In this paper, results supported algorithms projected by Omar K.,et al., Ahmed Hasswa, et al. and C Chrysostomou, et,al. are mentioned wherever researchers propose vertical handover(VHO) for performing mobility management in heterogeneous wireless network supported bandwidth, delay, coverage and power consumption.

Keywords*:* RSS, QoS, WiMax, 4G, VHO.

INTRODUCTION

The world of presentation Entering into the new time of versatile correspondence, one should meet prerequisites of fourth era (4G) remote framework in order to give altogether higher information rates, QoS, cost and consistent portability. This can be accomplished by picking the most proper access connect among the accessible options (counting IEEE 801.11-WLAN and IEEE 802.16-WiMAX). Not with standing the customary cell communication systems which are generally open today. For an agreeable client encounter, portable terminals must have the capacity to consistently exchange to the best access connect among all accessible in order to keep away from call drop and permit continuous progressing calls. Such capacity to hand over between heterogeneous systems is alluded to as consistent vertical handovers [1][2]. Presently a day's different research points of wireless connectivity frameworks depend on vertical handover system and the versatility administration. The vertical handover choice is done in light of various parameters like Received Signal Strength (RSS), idleness, accessible data transfer capacity, control utilization, cost, client inclinations and SNR. In this paper, we arrange distinctive vertical handover calculations into three gatherings and offer a similar investigation of different calculations in each gathering.

HISTORY OF HANDOVER

Handover, often called as handoff, is an occasion, when a user moves starting with one remote cell then onto the next. It can be ordered into two fundamental sorts; Horizontal (intra-framework) and vertical (between framework). Horizontal handoff implies handoff between similar access technologies, and vertical handoff implies handoff among heterogeneous remote access organize advancements. Our essential concentration is vertical handoff because of which the itemized examination of level handoff is left to the per users and scientists. The vertical handoff process can be separated into three fundamental advances [2],

i) To be specific framework disclosure

ii) Handoff choice, and

iii) Handoff execution.

Amid the framework disclosure stage, versatile terminals outfitted with numerous interfaces need to figure out which systems can be utilized and the administrations accessible in each system. The systems may likewise broadcast the upheld information rates for various administrations. Amid the handoff choice stage, the cell phone figures out which arrange it should associate with. The choice may rely upon different parameters including the accessible transfer speed, delay, get to cost; transmit control, current battery status of the cell phone, and the user equipment 's inclinations. Amid the handoff execution stage, associations should be re-steered from the current system to the new system in a consistent way.

HANDOFF DECISION

The basic leadership procedure of handoff might be brought together or decentralized. The handoff choices can be grouped into:

i) Network Controlled

ii) Mobile Assisted and

iii) Mobile Controlled.

i) Network controlled:

In a network controlled handoff convention, the system settles on a handoff choice in view of the estimations of the Mobile Stations(MS) at various Base Stations(BS). It is utilized as a part of original simple frameworks.

ii) Mobile Assisted:

In a mobile assisted handoff process, the MS makes estimations and the system settles on the choice. This kind of handoff choice is utilized as a part of the circuit-exchanged GSM (Global System for Mobile).

iii) Mobile Controlled :

In this type of , handoff, every MS is totally responsible for the handoff procedure.

CRITERIA FOR VERTICAL HANDOFF ALGORITHM

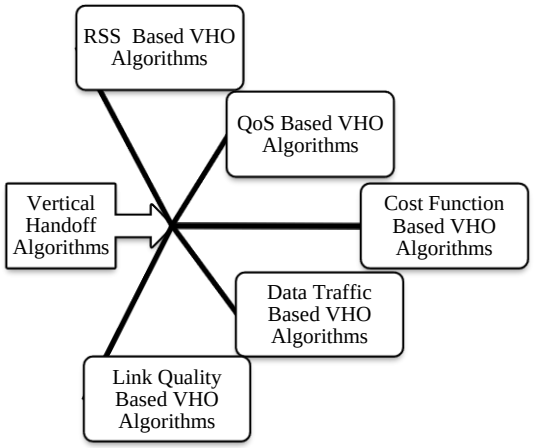

Figure 1 : Broad Classifications of VHO[7]

The above figure 1 demonstrates how VHO are arranged into various gatherings. A significant number of the specialists focus their examination chip away at least one parameters of VHO as appeared in figure 1. Significant work has been done in the writing to decide the fitting parameters that can be considered in the choice procedure for VHO. In this area, we quickly talk about various VHO criteria. A delegate set of VHO calculations are likewise talked about and these calculations are doled out into one of these criteria. It might conceivable that a portion of the calculations may utilize more than one VHO criteria.

RSS Based VHO Algorithms:

In this gathering, RSS is utilized as the fundamental handover choice basis and is the most generally utilized. RSS based VHO calculations look at the RSS of the present point with the others to settle on handover choices. [1] [3] [14]. Due to the straight forwardness of the equipment required for RSS estimations, an expansive number of studies have been directed around there [2][3][14] . We portray a portion of the delegate RSS based VHO calculations. Zahran, Liang & Saleh, proposed a versatile lifetime-based handover calculation [6] in which a lifetime metric was considered. This calculation includes two situations. In the primary situation, a handover from WLAN to the 3G system will happen if the RSS normal of WLAN association is not exactly predefined edge. While in the second situation, a handover is started if UE moves a 3G system to WLAN. The handover will be completed if adequate data transmission is accessible on the WLAN arrange and if the limit of 3G organize is beneath normal RSS esteem. [4] [6]. This calculation have distinctive favorable circumstances over conventional RSS based calculations like; adaption to application prerequisites and client versatility, change on the accessible data transmission. Along with these points of interest, this calculation has couple of disadvantages, for example, long parcel postponement and additional circle up table. Second approach was proposed by Mohanty and Akyildiz viz RSS edge based dynamic calculation [14]. Here the current RSS is contrasted and the dynamic RSS edge and handover choice is taken. As proposed by creators, the utilization of a dynamic RSS limit decreases the false handover and increment versatile availability of the client. The upside of this calculation is, the handover disappointment likelihood from 3G systems to a WLAN cell is thought to be zero. Furthermore, the real downside is increment in RSS examining delay.

QoS Based VHO Algorithms:

For an effective handover, alongside RSS, transmission capacity and flag to commotion proportion are the critical parameters to be considered. Transfer speed is a measure of accessible information correspondence assets. It demonstrates diverse movement conditions in the entrance arrange and gives defer data to the client. In this gathering, the emphasis is given on the accessible transfer speed for a versatile terminal and flag to impedance commotion proportion. While talking about these calculations, one ought to recollect that RSS is the principle and imperative criteria for handover. Remembering, before handover it is basic to check RSS before handover. For the dense area, concept of introducing small cells proves the better solution[8]. Lee, Chen and Sun [11] proposed a QoS based VHD calculation which considers lingering data transfer capacity and client benefit necessities for handover choice handover from WLAN to Wireless Wide Area Network (WWAN) and the other way around. Here the handover calculation is started if the deliberate RSS is reliably underneath a limit (RSST1). The calculation likewise thinks about the condition of the portable terminal amid handover. On the off chance that the portable terminal is in the sit without moving state, a handover is performed; generally the handover

choice depends on the client application sort. For delay-delicate applications, a handover happens just if the present serving WLAN can't give enough data transfer capacity where as WWAN is prepared to give transmission capacity to the application. For the applications where delay is middle of the road, a handover happens if the WWAN gives higher data transmission than the WLAN. At the point when the portable terminal is associated with a WWAN, a comparative procedure is done if back to back signals from the WLAN with RSS over an edge (RSST2) are gotten. The upside of this calculation is it ready to accomplish high framework throughput, bring down handover dormancy. In any case, its disadvantages are with higher transmission capacity, a handover choice is troublesome [11]. Yang, Gondal, Qiu and Dooley concocted a transfer speed based VHD strategy amongst WLANs and WCDMA utilizing SINR [10]. Here, the Signal to Interference and Noise Ratio (SINR) computation of the WLAN signals is changed over to a proportional SINR to be contrasted and SINR of the WCDMA channel. Creators finished up; this calculation performs handover to the system with bigger SINR. Preferences of SINR based handovers over RSS based handovers are ; it can give clients higher general throughput, and results in an adjusted load between the WLAN and the WCDMA systems. Also, disservice is it might present inordinate handovers with the variety of the SINR making the hub hand over forward and backward between two systems [13].

Cost Function Based VHO Algorithms:

The cost work based calculations join measurements in a cost work. The essential advantages of cost work based calculation are it starts handover for various applications with expanded level of client ask for and decreased blocking likelihood. Hasswa et al. suggested a VHO calculation which depends on a costs work [9]. With the help of Tramcar, higher user satisfaction is observed. The calculation gives its most elevated need for the dynamic applications and afterward the cost of every conceivable target arrange for the administration with the most noteworthy priority

EXPERIMENTAL RESULTS

A. Omar Algorithm

The calculation is actualized by utilizing MATLAB Tool, figure 2 demonstrates the reproduced aftereffects of the Omar Algorithm[1]. In this calculation VHO call gets introduced, if the present system or RAT is having adequate flag quality then the call is proceeded with current system. Be that as it may, if as protest moves far from current RAT, it might causes corruption there might be a probability of derivation in the flag quality of current RAT. At that point it watches that the VHO call is because of the option session or basic session. Need is given to Imperative session if both the sessions are executing at the same time. The call is rejected if accessible RAT not having adequate assets with it else call is acknowledged and VHO call gets finished.

B. Hassawa Algorithm

In the view of Hasswa calculation experimentation is finished by utilizing Matlab Tool. The figure 3 demonstrates exploratory after effects of the Hasswa et al. calculation[5]. The calculation depends on the RSS esteem and client inclinations. Here data transfer capacity, inactivity, connect quality is considered for client inclinations. This calculation chooses the system which is having a decent quality factor than the present and different systems.

Figure 2 : Experimental Results of Omar Algorithm

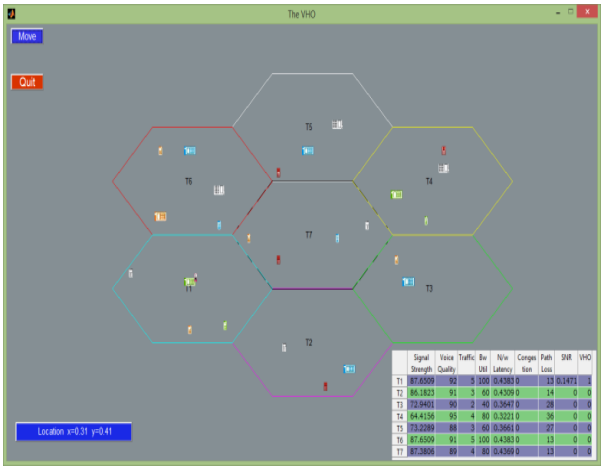

Figure 3 : Experimental Results of Hassawa Algorithm

C. Fuzzy Logic Based VHO

Fuzzy Logic Controllers (FLCs) as shown in figure 4 might be seen as option, non-customary method for outlining input controllers, where it is advantageous and powerful to fabricate a control calculation without depending on formal models of the controlled framework and control theoretic devices[9]. The control calculation will be embodied as an arrangement of conventional tenets. FLCs will be connected to the assignment of controlling frameworks for which investigative models are not effortlessly reachable or the model itself, if accessible, is

excessively unpredictable and profoundly nonlinear. As a rule, to characterize the phonetic standards of a fuzzy variable, Gaussian like, triangular or trapezoidal molded enrollment capacities are utilized. Determination of Gaussian like enrollment capacities prompts smoother control surfaces. at that point, the lead base is tweaked by watching the advance of reenactment, for example, cell misfortune events and request versus throughput bends. the tuning should be possible on account of various destinations. for instance, any pick up in throughput must be exchanged off by a conceivable increment in the defer experienced at the terminal lines. nonetheless, since the tuning of the fuzzy principles is instinctive, and can be connected in basic semantic terms with client's understanding, it ought to be a clear issue to accomplish a fitting harmony between a middle of the road end-to-end delay, and the expansion in throughput. on the other hand a versatile fuzzy rationale control strategy can be utilized which can tune the parameters of the fuzzy rationale controller on line, utilizing estimations from the framework.

Figure 4 : Experimental Results of Fuzzy Based Algorithm

The table 1 provides analysis of VHO algorithms based on the experimental results.

Table 1 : Analysis of VHO Algorithms

Sr. No.	Algorithm	Advantages	Disadvantages
01	Omar Algorithm	Improved bandwidth utilization. Reduced decision drops.	Underutilization of network resources. Increased handover delay.
02	Hassawa Algorithm	Reduced latency. Increased throughput.	Ping-pong effect is observed. High blocking rate with increased breakdown.
03	Fuzzy Algorithm	Reduced blocking rate. High throughput with low latency.	Less security. Increased Call drop rate.

CONCLUSION

In this paper, we exhibited the execution correlation between various vertical handoff choice calculations. These calculations were isolated into various gatherings, for example, RSS, QoS, Cost function, Data traffic and Link quality Based VHO Algorithms. Correlations of all the above calculations talked about above are done in the view of their capacities, points of interest, detriments, which may influence the general execution of the system. RSS based algorithms have totally different advantages as increase in user quality, improvement on the accessible information measure, handover failure chance is taken into account to be zero. QoS based mostly algorithms square measure verified higher in performance because of its high system throughput and lower relinquishing latency. While cost function based mostly algorithms decreased the interference rate with decrease in cost function parameters like bandwidth, battery power and delay.

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