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FACULTY OF ENGINEERING

Electronics and Communications Engineering Department

Handover Techniques In Heterogeneous Mobile Networks

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Submitted by

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Statement

This dissertation is submitted to Ain Shams University for the degree of Master of Science in Electrical Engineering (Electronics and Communications Engineering).

The work included in this thesis was carried out by the author at the Electronics and Communications Engineering Department, Faculty of Engineering, Ain Shams University, Cairo, Egypt.

No part of this thesis was submitted for a degree or a qualification at any other university or institution.

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To My Parents

*I present to you this
thesis to express my deep
gratitude and love*

Thanks

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All Gratitude to ALLAH

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Abstract

Handover means transferring an ongoing call or data sessions one cell to another. Handovers occur due to the movement of the mobile user from one area to another area. Handovers are used to prevent an ongoing call to be disconnected. If we don't use handovers then whenever a user leaves the area of a particular cell then its ongoing call is immediately disconnected. The process of handovers requires a number of parameters e.g. what is the handover scheme we are using, how many channels are free. In the handover process we should also keep into consideration the required handover parameters as QoS, subscriber velocity, subscriber applications, target cell load, etc. There exists around hundred handover parameters that affect handover process; we can't say certain combinations of parameters are the best choice. We have to choose the suitable parameters to our network model and operator requirements. Vertical handover refers to automatic switching the communication/data session from one technology to the other. So, it's different from a horizontal handover among various wireless access points using the same technology. A suitably equipped device may be able to use both technologies at a time, the high speed Wireless LAN and cellular technology.

In this thesis, a fuzzy based vertical handover is between LTE and WLAN is proposed. The technique uses the subscriber velocity, the target cell load, and the target cell RSS level as input parameters to the fuzzy logic system. The output is the handover decision, this is used to allow certain subscriber to make handover to certain cell or prevent him. MATLAB simulation is used to compare the performance of the proposed one with LTE hard handover technique. Another hysteresis based vertical handover is introduced. This algorithm uses the subscriber velocity, the subscriber balance, and the subscriber application to differentiate different subscribers. This algorithm gives the highest priority to the subscriber with high speed applications and high balance to make handover to the high speed resources hot spot.



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SUMMARY

In this thesis a new fuzzy based vertical handover technique is proposed. This technique is used to guarantee seamless mobility between 3GPP networks, LTE in our simulation model, and non-3GPP networks, WLAN in our simulation model. This technique is used based on Fuzzy logic and uses subscriber velocity, target cell load, and target cell received signal strength. This algorithm uses subscriber velocity as indication if the WLAN is the target cell of this subscriber or he is just passing by this cell. In case of fast subscriber, no handover is performed to WLAN even if WLAN signal strength is higher than Macro cell. This thesis consists of five chapters.

Chapter1 introduces the mobile network evolution showing different mobile generations. It also shows an introduction to WLAN networks showing different technologies. Seamless mobility was explained showing interaction between cellular and cellular networks.

Chapter2 introduces a heterogeneous mobile networks study, the difference between the traditional mobile networks and the heterogeneous mobile networks, the new network topology, and the proposed network architectures.

Chapter3 explains the concept of handover. It explains different types of handover events, different handover types; this chapter provides an overview of IEEE 802.21 protocol. It shows the new proposed definitions and the network architecture. Scan of previous work was introduced. Different handover techniques, and scan on the previous work and introduced

Chapter4 presents a traditional LTE hard handover algorithm, the new proposed vertical handover algorithm, and the simulation results comparing the performance of the traditional technique and the proposed technique. It also introduces adaptive hysteresis vertical handover algorithm and compare the simulation results with tradition algorithm under different conditions.

Finally, chapter5 suggested the future mapping to complete this work and introduces the thesis's final conclusion.

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