REVIEW: ANN BASED HANDOFF CONTROLLER FOR MICROCELLULAR MOBILE NETWORKS

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Abstract

In mobile cellular system handoff refers to the process of switching the ongoing call from one base station to another in an efficient way. Before switching the call or performing handoff an efficient handoff decision has to be taken. In traditional approach the handoff decision were taken on the basis of three parameters such as Distance between BS and MT, Network Load which refers to the number of users in the network and RSS which refers to the Received Signal Strength from base station. But selection of few parameters was not sufficient for increasing the handoff decision capability. Hence in order to enhance the handoff decision capability a new technique neuro fuzzy is proposed under this research which considers five input parameters distance, RSS, Load, Velocity and SIR respectively.
The proposed work generates a single output corresponding to five input parameters. The results section proves the efficiency of the proposed work on the basis of fixed network load and fixed distance parameters.
Keywords-Base Station, Handoff, Received Signal Strength, Artificial Neural Network.

I. INTRODUCTION

With the advancement of time, number of changes have been observed in the technology. Drastic changes have been observed in the communication systems.. As the time passed, evolvements in the technology took place and so did the communication mediums changed. The wireless communication replaced the Wired Communication that gave birth to cellular phone services. Wireless mode of communication gained popularity because of its characteristic features like scalability, flexibility, mobility and ease of access. The advantages of wireless communication are more reliability, less complexity and lesser cost because it do not involves use of any wires.. Now, since each system has some pros and cons and so wireless communication also have some demerits. The problems in the wireless network occur due to environmental conditions like bad weather or sometimes by human error. One major issue that is to be taken care of in cellular systems is handoff.

II. HANDOFF

Handoff is a process that arises when the on-going call is to be transferred from one base station to another. The coverage area of the cellular network is divided into smaller regions for efficient network coverage and the network to the mobile terminals is provided by the base station.These small regions are called as Cells. When there is a mobile user, on the basis of received signals strength from BS, the call keeps on switching from one base station to another. Handoff also refers to condition, when the call is transferred from one base station to another without dropping the call. The signal strength of the nearby base station is compared with the signal strength of the current base station and the call switches to one having comparatively greater signal strength. This whole process should happen without dropping of the call. For wireless communication to be efficient the call drop rate should be minimum and the handoff occurs successfully in it.

III. PROBLEM FORMULATION

Handoff is the process of transferring a call or sometimes data session from one base station to another during an ongoing call or data session and when a user is mobile. Handoff decisions should be taken in such a way that the signal strength do not drops and the call is not disconnect in between. A system is considered to be most efficient if it do not faces signal drop and successful handoff is obtained. The problem of handoff occur because frequencies cannot be reused in adjacent cells, when a user moves from one cell to another, a new frequency must be allocated for the call. If a user moves into a cell where all available channels are in use or being occupied, the user's call must be terminated. Earlier various parameters are considered for making the handoff decision .Then the fuzzy system came into existence for taking the handoff decisions. Though the fuzzy systems were considered to be efficient but it too had some limitations like fuzzy systems were only transparent for simple problems. Since the handoff decision were taken on the basis of the various parameters. So if the numbers of parameters are increased the complexity of the system is increased. Increase in the number of parameters reduces the decision taking capability of the system which in turns affects the Quality of service. This results increase in the complexity of the system that can reduce the efficiency of the system. So there is need to design the system in which complexity is reduced and the system is made efficient so the handoff decisions are taken accurately.

IV. PROPOSED SYSTEM

Handoff is observed when user is mobile and the signal strength of the next base station is greater than the signal strength of the base station that is currently connected to the mobile device. In previous techniques the handoff is firstly dependent on random selection. Later on many approaches has been developed one of them was on basis of static approaches. After that the Fuzzy system based approaches were introduced that were able to increase the capability of the handoff controller. The major problem faced in these systems was that the complexity of the system increases as the numbers of the parameters are increased that in turn reduces the efficiency of the system. So in this proposed work a new approach is proposed to reduce the complexity of the system. In this work neuro fuzzy system uses two fuzzy controllers are used in which parameters are defined according to their specified categories. Along with this the weight values

are defined. On the basis of the weight value the final result are obtained according to which the handoff decision are taken. In this work the handoff decision is taken on the basis of five parameters that will help in taking the handoff decision. This method will reduce the system complexity as two fuzzy controllers are used. Also the efficiency of the system is increased.

4.1 Algorithms Used Previously : Various algorithms have been introduced regarding the Handoff decision making. Some of them are discussed below:

a. Fuzzy Logic Based Handoff Controller for Microcellular Mobile networks

In this approach, a Fuzzy logic based algorithm for handoff decisions is presented. The proposed algorithm provides an intelligent handoff decision, in which three input parameters: Distance between BS and MS,Received signal strength from BS and network load on the cell are evaluated and feed to the fuzzy inference system. The output obtained from the fuzzy inference system is handoff decision . The results reveals that the handoff factor increases as the distance between the mobile station and the current base station increased. The handoff factor also increases if the number of users (Network Load) in the current cell increases.
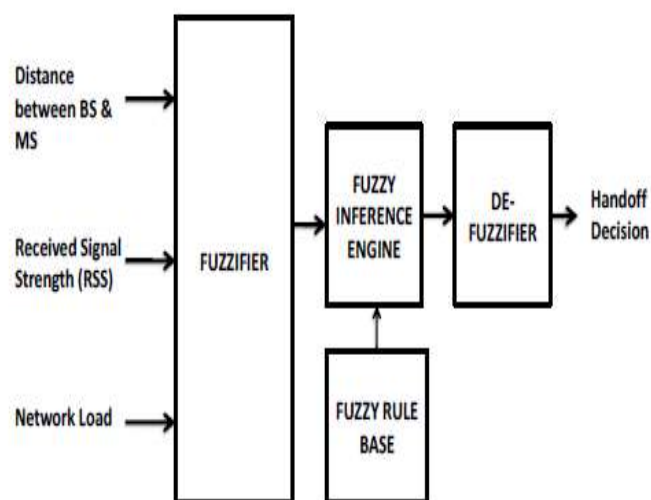

Fig.1 Distance, RSS and Network based Handoff approach

b. Fuzzy Simulation Model for Vertical Handoff in Heterogeneous Networks

The vertical handoff depends upon number ofparameters. In this paper eight parameters areconsidered for vertical handoffs which arebandwidth, RSS, security, delay, jitter, velocity, costand losses. By using FQDA and simulink model thenumber of parameters increases with less number ofrules which results in better performance with lesscomplexity. The rest of the paper is organized asfollows: section 2 provides efforts of researchers inthis field, section 3 presents fuzzy logic basedproposed scheme, section 4 provides results ofsimulation and section concluded the proposed work.Proposed models resulted in simulation with largenumber of attributes with lesser number of fuzzyrules. In this work instead of 6561 rules, only 81rules have been used for eight

attributes. Largenumber of attributes improves the quality of service(QOS) in heterogeneous networks. In this paper thehandoff is performed between WWAN and cellularnetwork. This modified fuzzy method also resulted inlesser number of handoffs as compared to traditionalmethods.

c. Network selection using MADM methods in handoff process

The new base station network is selected by using handoff algorithm. It involves threephases: (i) Handoff initiation, (ii) Handoff decision, (iii) Handoff execution. During handoffinitiation, the optimal time to initiate handoff is taken place. According to the user'sinformation and segment availability, handoff is initiated. For this, three different QoSparameters are used. They are Bit Error Rate (BER), Received Signal Strength (RSS), andCoverage Area.with the imprecise information data, MADM is well suited.Moreover MADM is a qualitative approach. The unique goal for selecting a network usingMADM method has two options. 1. Select a criterion presenting the networks with bestcharacteristics.2. Classify the criteria based on role model.It is more complex to make handoff decision in heterogeneous network by considering different criteria. The trade – off of some criteria is required. The approach of fuzzy MADMwill solve this problem and deal with imprecise handoff criteria and user's preference.
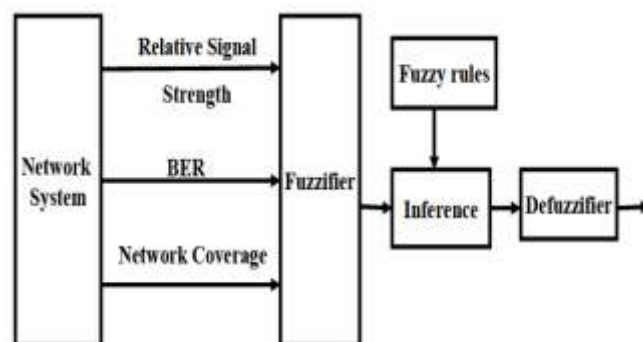

Fig. 2 Block diagram of MADM based Hnadoff Process

Context Aware Fuzzy Rule Based Vertical Handoff Decision Strategies for Heterogeneous Wireless Networks

This paper proposes a QoS aware fuzzy rule based vertical handoff mechanism Using fuzzy logic quantitative decision algorithm (FQDA) is used as an handoff decision criteria to choose which network to handover among different availableaccess networks. The QoS parameters considered are available bandwidth, end-to-end delay, jitter, and bit error rate (BER).QoS aware fuzzy rule based algorithm gives better QoS performance for delay sensitive applications like conversational, interactive and live streaming applications. Our future work will consider minimal fuzzy rule set based vertical handoff algorithms for heterogeneous wireless networks.

V.   PROPOSED WORK

Handoff is generally observed when user is mobile and the signal strength of the next base station is greater than the signal strength of the base station that is currently connected to the mobile device. In previous techniques the handoff is firstly dependent on random selection. Later on

many approaches has been developed one of them was on basis of static approaches. After that the Fuzzy system based approaches were introduced that were able to increase the capability of the handoff controller. The major problem faced in these systems was that the complexity of the system increases as the numbers of the parameters are increased that in turn reduces the efficiency of the system. So in this proposed work a new approach is proposed to reduce the complexity of the system. In this work neuro fuzzy system uses two fuzzy controllers are used in which parameters are defined according to their specified categories. Along with this the weight values are defined. On the basis of the weight value the final result are obtained according to which the handoff decision are taken. In this work the handoff decision is taken on the basis of five parameters that will help in taking the handoff decision. This method will reduce the system complexity as two fuzzy controllers are used. Also the efficiency of the system is increased. This work purposes a neuro fuzzy system for increasing the handoff decision making capability. The technique produces output on the basis of five parameters are as follows:

1. Distance
2. Signal Strength(RSS)
3. Load
4. Velocity
5. SIR (Signal to Interference Ratio).

The designed neuro fuzzy system generates a single output on the basis of above five parameters.

VI. SCOPES OF WORK

Handoff is an important element of wireless cellular communications. Efficient handoff algorithms are a cost-effective way of enhancing the capacity and QoS of cellular systems. In this work neuro-fuzzy based approach for hand-off decisions has proposed. The proposed work of this is hybridization of two intelligent systems ANN and fuzzy logic in order to give better results along with increased input parameters i.e. distance, Received signal strength, load velocity and signal to interference ratio. These parameters are used for enhancing the system performance and the output of system is handoff decision probability. The proposed system simulation results much better than traditional approach and increase handoff decision probability.

In future data set can be normalized so that system complexity reduces and speed of system for handoff decision increases.

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