Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X
IMPACT FACTOR: 6.017

IJCSMC, Vol. 6, Issue. 6, June 2017, pg.96 – 102

Seamless Mobility for Heterogeneous Networks on GRA and MEW Methods

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Abstract— one of the major issues in next generation heterogeneous networks is the problem of vertical handoff which requires seamless mobility based on quality of service. Current handoff decision models which are based on single strength are not sufficient to provide reliable and ubiquitously mobility across heterogeneous networks. The proposed system is the based on determining the best network from the available networks and to reduce the unnecessary handoffs. Multiple attribute decision making methods have been used to process handoff decision. This paper defines the vertical handoff and introduces a handoff decision model for heterogeneous networks based on Grey Relational Analysis (GRA) and Multiplicative Exponential Weighting (MEW) methods. GRA methods are used to get an ideal solution. GSM, EDGE AND CDMA are the networks applied for handoff selection. Different parameters such as bandwidth, data rate, delay jitter and cost of the network has been used for analysis.

Keywords— "GRA", "MEW methods" and different parameters", "handoffs" and "MADM methods".

I. INTRODUCTION

Handoff process canister live see as having three stages: (1) system discovery (2) handoff detection, and (3) handoff execution. System discovery the networks which container be used with the mobile terminal be single-minded by it. The support information rates and Quality of Service (QoS) parameters may also be advertise by these network. Handoff detection includes network unearthing and handoff decision. Which type of handoff metrics must be use and how to apply them to create the handoff decision are the main problems into handoff detection. In handoff execution, the mobility organization plays an important task. The signal overhead and handoff latency be different in dissimilar mobility protocol. To achieve seamless and fast handoff, these three stages should be paid consideration to. The time when he handoff decision is made consequence the generally performance of the handoff process such as packet loss deep signaling slide in handoff management lead to great handoff latency**.** In a heterogeneous wireless set of connections, a handoff method will be dissimilar from that in a single network. There might be two types of handoff method: horizontal handoff (HHO) and vertical handoff (VHO). A HHO happens connecting different sector prohibited with different base stations (BS) or access points (AP) by the same wireless knowledge. A VHO is a handoff connecting different sector by different wireless technologies. In predictable HHOs, simply signal strength is measured for production a handoff decision. But in VHOs, some other metrics can be measured used for the handoff decisions, such as QoS parameter. The design of seamless and competent VHOs is an important and demanding concern in the advance of the 4G wireless network.

II. RELATED WORK

Liton Chandra Paul proposed "Handoff / Handover Mechanism for Mobility development in Wireless Communication". The handoff / handover concepts in wireless communication. Mobility is the discrete feature of wireless mobile cellular system. As a mobile subscriber move about between different telephone system networks, a handover process is desired to change its position of attachment. The continuation of an active call is one of the most important class measurements in cellular systems. Handoff processes enable a cellular system to provide such a capacity by transferring a dynamic call from one cell to another. Usually, continuous service is achieved by supporting handoff which is the transfer of an ongoing call from the current cell to the next neighboring cell as the mobile moves through the reporting section. The paper represents the present approach of handoff initialization, detection strategy and their relative benefits and disadvantage.

Abhinav Kumar, Hemant Purohit, proposed "A comparative study of different types of handoff strategies in cellular systems". The brief explanation about the different handoff techniques in cellular systems furthermore it compares all the handoff strategy on the basis of execution time, S/I ratio, RSS (Relative Signal Strength), call. Handling difficulty, handoff made and production methods. Handoff strategies are very used in wireless communication where it can be known that which handoff strategy is not using in very competent manner and it can also find the brief comparison between all handoff strategies which are used in mobile message.

III. HANDOFF IN HETEROGENEOUS NETWORKS

In cellular telecommunications, the term handover or handoff refers to the process of transfer a continuing call or data session from one channel connected to the interior network to another. In satellite infrastructure it is the processes of transferring satellite manage accountability from one soil station to another lacking failure or interval of service.

In the interworking of heterogeneous network, lone of the main challenge is seamless vertical handoff. A number of issues should be considered such as handoff metrics, handoff decision algorithms and administration in classify to attain seamless handoff. Vertical handoff, the major handoff metric is the received signal strength. Handover, in vertical handoff, simply the received signal strength is not adequate to make a handoff decision. The handoff metrics may well include cost of service, available bandwidth, power requirements, quality of service, and user preference. The vertical handoff could not take leave only at the cell boundary. It can take place at any time, depending on the network condition and user predilection. Such collective metrics guide to a challenge for scheming a handoff decision algorithm since some factor are more difficult to gain than the material level parameters such as received signal strength (RSS) and signal-to-interference ratio.

Horizontal vs. Vertical Handoff

Handoff among homogenous networks anywhere one type of network is considered be called horizontal handoff. On the other tender, handoff between dissimilar types of network is moreover probable.

Horizontal Handoff:

A Horizontal handoff or intra-system handoff is handoffs that occur among the APs or BSs of the similar network technology. In further terms, a horizontal handoff occurs involving the homogeneous cells of a wireless admittance system.

In cellular network canister be auxiliary classify into intra-cell and inter-cell handoffs. In intra-cell handoff income when a user touching by mobile workstation within a network or cell and the radio channels change in order to decrease inter channel interference under the same base station.

Vertical Handoff:

The switching involving points of affection or base stations, that belong to the dissimilar network technologies be called Vertical handoff and is requisite in diverse networks[5]. Straight up handoff or inter-system handoff is a handoff to occur between the dissimilar points of affection belonging to different complex technologies.

Vertical handoff canister be there separated into three steps, specifically system as discovery, handoff decision and handoff effecting. In descending vertical handoff the mobile customer channel changes to the network that have higher bandwidth and imperfect coverage, while in upward vertical handoff the mobile user transfer its correlation to the network with worse bandwidth and wider reporting.

IV. MULTIPLE ATTRIBUTE DECISION MAKING (MADM)

The MADM method is based on "GRA" and "MEW" though we apply it in a distributed comportment. Therefore, we place the computing dispensation in the visited networks relatively than on the mobile terminal. MADM allows the terminal to choose the "best" network towards which it determination is connected.

The commonly used MADM techniques are: the taken as a whole score of a candidate set of connections is resolute by the weighted summation of all the attribute values., Multiplicative Exponent Weighting (MEW), Grey Relational Analysis (GRA) is then use to rank the candidate networks and select the one with the highest ranking. The vertical handoff resolution with multiple attribute is a composite problem, MDP. To covenant through the false handoff indication, an optimizing handoff trigger technique based on Global Positioning System (GPS), Location Service server (LSS), is planned to Christian name as GRA[9].

A. Grey Relational Analysis

The major procedure of GRA [10] is first translating the performance of all alternative into a comparability sequence. This step is called grey relational generating. According to these sequences, a reference sequence (ideal objective sequence) is definite. Then, the grey relational coefficient among all comparability sequences and the reference sequence is considered. Finally, pedestal on these grey relational coefficients, the grey relational grade among the reference sequence and each comparability sequences is calculated.

- *Grey Relational Generating*

Thus, processing all presentation ethics for every alternative into a comparability sequence, in a process equivalent to normalization, is indispensable[10]. This dispensation is called grey relational generating in GRA. For a MADM quandary, if there are m alternatives and n attributes, the i th

Alternative can be expressed as wherever is the performance value of j attributing of alternative i.

$$x_{ij} = \frac{y_{ij} - min\{y_{ij}, i=1\ldots m\}}{max\{y_{ij}, i=1\ldots m\} - min\{y_{ij}, i=1\ldots m\}} \text{---------- } (1)$$

$$x_{ij} = \frac{max\{y_{ij}, i=1\ldots m\} - y_{ij}}{max\{y_{ij}, i=1\ldots m\} - min\{y_{ij}, i=1\ldots m\}} \text{---------- } (2)$$

- *Reference Sequence Definition:*

Later on than the grey relational generating process using all performance standards determination be scaled into [0, 1]. And then aim to find the alternative whose comparability sequence is the neighboring to the reference sequence.

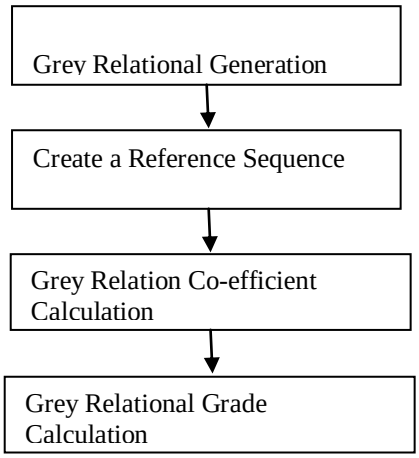

Figure 1: Procedure of Grey Relational Analysis

- *Grey Relational Coefficient Calculation*

Grey relational coefficient be used for determining how close $x_{ij}$is tox_{0j}. The larger the grey relational coefficient, the close x_{ij} andx_{0j}. Theory relational coefficient can be calculated by Eq. (3).

$$\gamma(x_{0j}, x_{ij}) = \frac{\Delta_{min} + \Delta_{\xi max}}{\Delta_{ij} + \Delta_{\xi max}} \text{ ---------- (3)}$$

In Eq. (3), $\gamma(x_{0j}, x_{ij})$ is the grey relational co-efficient between $x0j$andxij.

$$\Delta_{ij} = |x_{0j} - x_{ij}| \text{---------- (4)}$$

Δ_{min}=Min {i =1…m, j=1…n},

Δ_{max}=Max {i =1…m, j=1…n},

ξ is the distinguishing co-efficient, ξ ∈[0,1]

- *Grey Relational Grade Calculation*

  The Grey Relational Grade can be there calculated by Eq. (5)

  $$\beta(x_0, x_i) = \sum_{j=1}^{n} w_j \gamma(x_{0j}, x_{ij}) \text{ -------- (5)}$$

In Eq. (5), $\beta(x_0, x_i)$ is the grey relational grade among X_0 and X_i. The level of correlation among reference sequence and comparability sequence has be represented. The weight has been given by w_j. If a comparability sequence gets the maximum grey relational grade through the reference sequence, then that determination is the best choice.

B. Multiplicative exponential weighting (MEW)

The major difference is that in its place of adding typically mathematical operation at this time there is development. As with all MADM methods, WPM is a fixed set of resolution alternative explain in conditions of a number of decision criteria. The vertical handover choice quandary can be expressed as a atmosphere form and each row i corresponds to the candidate network I and each column j correspond to the attributes, Where rij denotes attribute j of candidate network i, we denote the weight of attributed j.

$$A^*_{MEW} = max_i \prod_j rij^{wj} \text{ ---------- (6)}$$

C. Performance evaluation

- Performance Analysis:

Here the Simulation Parameters are,

- Candidate networks are X1, X2, and X3
- Criteria are A1, A2, A3, A4 and A5
- Calculates Voice Application

User preference for Voice application is also transformed to crispy numbers and normalized so that is equal to 1. The normalized preference, i.e. the weighting factors for the voice Wv application is: [0.4 0.2 0.1 0.1 0.2]

Table 1: Measures of Alternatives Based on Criteria

	Band Width (A1)	**Data Rate (A2)**	**Delay (A3)**	**Jitter (A4)**	**Cost (A5)**
GSM (X1)	20	30	60	50	10
EDGE (X2)	30	65	50	15	8
CDMA (X3)	15	10	62	60	20

Calculating the Grey Relational Reference for the networks for $x_{ij} = \frac{20-15}{30-15}$ x_{ij} =0.333 likewise we calculate for each and every alternative.

D. Result Analysis

The Fig: 2 we assign 0.5 as distinguishing co-efficient value, then GSM band-width as well as Date rate has decreased heavily. And cost has increased, so it will not be a good option to choose. EDGE has the highest value for bandwidth, date rate and its transmission delay, jitter and cost has little decrease. CDMA has decreased bandwidth, data rate, increased delay, jitter and cost. So here comes EDGE as the best option for handoff selection when compared to other networks.

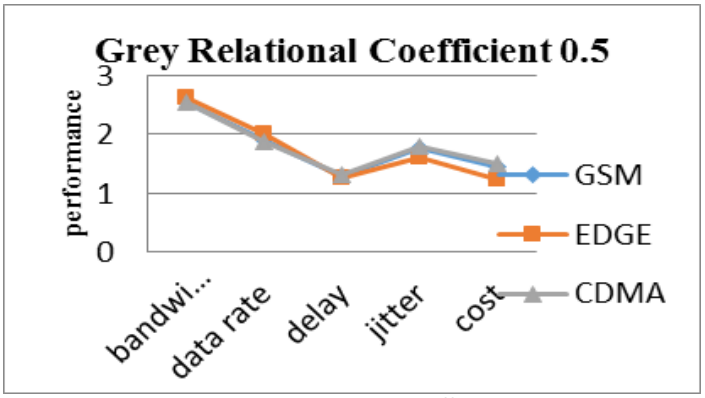

Figure 2: Grey Relational Coefficient 0.5

We have obtained the grey relational grade for all the alternatives by propagating with their corresponding weights. EDGE reference sequence is nearer to the comparability sequence in band-width and Date rate criteria. Therefore it is the best alternative for handoff, although its delay, jitter and cost show higher values in which it should be lesser the better. GSM delay, jitter and cost is lesser compared to other three alternatives. But it does not have larger coverage, thus it needs too many handoffs which is not a good option. CDMA results are not considerable here since it shows poor measures still its delay, jitter and cost is average.

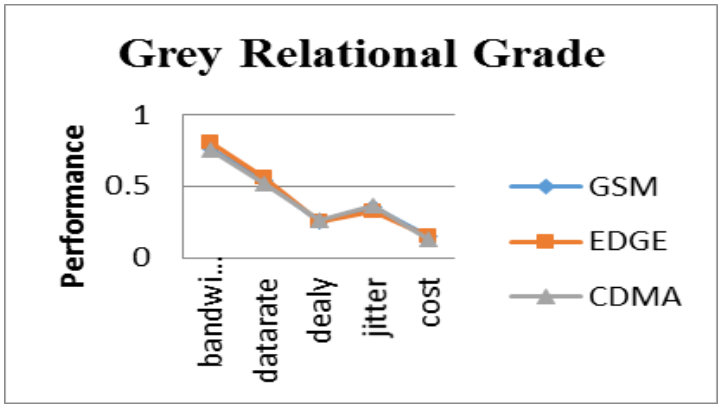

Figure 3: Grey relational grade

The grey relational grade values are represented by multiplying the criterion co-efficient values with their corresponding weights. Even though the delay, jitter and cost of the EDGE is decreased, it shows good performance for bandwidth and data rate while compared with other alternatives.

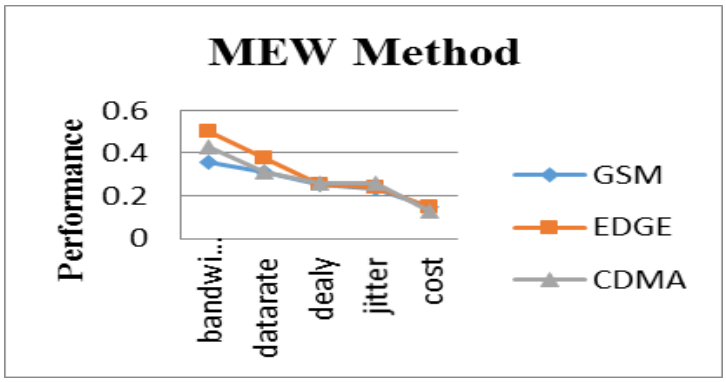

Figure 4: Mew method

These measures are based on Concordance value. For GRA and MEW methods shows higher values for handoff decision making. The two methods are analysis the EDGE network is highest value. So, EDGE can be selected as a better choice for roaming after successful handoff.

E. Result and discussion

The results is the process and the eight node is using and simulation is the process and consider is implement signal strength and coverage area. The handoff process when a nodes travel from one node to another nodes. The packet sends the mobile terminals. vertical handoff process in network signal is the used and node process delay in dynamic decision handoffs algorithm method ,bandwidth, data rate, jitter, simulation time handoff drop is another network activation for trough connection for handoff seamless heterogeneous wireless network signal.

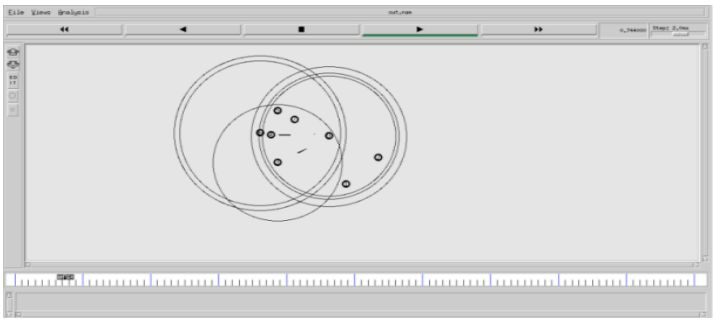

Figure5. Node creation for connection one to one

Figure 6: Packet data send mobile terminal

V. CONCLUSION

It is a tedious procedure to make handoff decision in heterogeneous wireless networks considering multiple criteria. This article introduced an efficient and innovative multiple attribute decision making (MADM) system. MADM distributes the computation of the network quality between targets of the mobile terminal and consider the band width, data rate, delay, jitter and cost parameters as metrics. Finally to compared both GRA and MEW methods. The method provides good result than EDGE network. In future work determination spotlight on enhancing techniques for our proposed system.

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