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SNR=Signal power/Noise power------0dB =Signal power=Noise Power;3dB=Signal power is twice with noise power

BER=ne/N------ne=Find number of errors; N= 10000000(Transmit N bits)

As SNR increases, bit error rate falls

**Continuous time AWGN channel:** Signal power=P; Noise PSD=N0/2; Bandwidth=2W;

SNR=P/( N0W)------Noise Power= Noise PSD X Bandwidth;

Time per Symbol=T=1/2W-----Symbol rate=2W

**Discrete time AWGN channel:**

Energy per Symbol Es=PT=P/2W Energy=PowerXTime

Noise Energy = σ2= Variance of Noise n= N0/2

SNR in discrete time= SNR in continuous time= Es/ σ2=P/ N0W

BER=Q(sqrt(SNR)); Q function BPSK FOR AWGN

* Empirical models can further be divided into two categories: time dispersive and nontime dispersive models. Time dispersive models take into account channel characteristics such as multipath spread. Nontime dispersive models predict the path loss in terms of distance, height of antenna, and frequency. These models are mainly based on observations as well as measurements.
* Deterministic Models. These models are related to the propagation of electromagnetic waves to find out the strength of the received signal at the particular point. It requires a 3D view of electromagnetic waves. Ray tracing is an example of deterministic models.
* Stochastic Models. These models generate predictions with the help of a series of random variables; these models are therefore less accurate than predictions based on empirical or deterministic models. But stochastic models require less information and have lower processing power requirements
* Path Loss Models. In wireless communications there is some loss of signal strength between the transmitter and receiver. This is called path loss and is the essential parameter used to predict the strength of signals in radio systems at various locations. The path loss is also dependent on environmental conditions and will be different in rural, urban, and suburban environments. Path loss models are usually dependent on both the distance from the transmitter as well as the frequency of the signal being transmitted. We can calculate the path loss in all these environments with the help of path loss models. Path loss can therefore be used to find the handover radius.
* Most Wireless LAN NIC cards can work between −70 and −85 dB [16]. For WLANs, it has been decided to use the Free Space Model due to the high frequency being used. For cellular networks, Okumura and Hata models perform better than Free Space Models.
* In the handover decision process, the mobile terminal selects the best available network available in a heterogeneous environment. 'is process of network selection uses some mathematical tools, such as MADM methods, game theory, Markov chains, fuzzy logic, artificial neural network algorithms in the field of machine learning [3–5], and utility functions used in two important issues in the integration of heterogeneous wireless networks, vertical handover decision, and optimal resource allocation for the handover [6–8]. Several conflicting criteria are involved in the network selection scheme, such as the quality of service (QoS), energy consumption, load, security, and user preferences.
* An important challenge for the network selection procedure is determining the degree of importance (i.e. the weight) of every network decision criterion. So, the weighting techniques that have been used to calculate criteria weight are subjective weighting methods, such as AHP (analytical hierarchy process) [9], ANP (analytic network process) [10], FAHP (fuzzy analytic hierarchy process), and FANP (fuzzy analytic network process), and objective weighting methods, such as the entropy technique.
* 'e addition of the objectiveness in the determination of the criteria weights requires minimizing (or maximizing) an objective function. So, metaheuristic techniques will be used instead of classic methods to identify the weight of each criterion when the resolution of the optimization problem becomes complex.
* Several strategies have been proposed by researchers in the literature, to select the best network, some of them use one single criterion, and other more complex schemes use multiple criteria
* In the vertical handover decision, several MADM methods are used to rank the alternatives, such as SAW (simple additive weighting), MEW (multiple exponent weighting), TPOSIS (technique for order preference by similarity to ideal solution), GRA (grey relational analysis), and VIKOR (VIsekriterijumsko KOmpromisno Rangiranje).
* Tran and Boukhatem [12] presented a performance comparison between classical MADM methods, such as SAW, MEW, and TOPSIS. 'is work shows that TOPSIS has a problem of “ranking abnormality, ” while SAW and MEW have a problem of “ranking identification. ” When networks order changes if the worst alternative is removed from the candidate networks list, it is called a ranking abnormality problem. 'e ranking identification problem occurs when it is difficult to determine with precision the best alternative. 'ey proposed the DIA (distance to ideal alternative) algorithm to eliminate ranking abnormality and have used Manhattan distance instead of the Euclidean distance used with TOPSIS
* most Metaheuristics algorithms are used to solve difficult optimization problems, for which conventional methods are not applicable. Many metaheuristic algorithms, inspired by biology behavior, are proposed to solve optimization problems. 'e most popular algorithms are the genetic algorithm (GA), artificial bee colony algorithm (ABC), and particle swarm optimization (PSO) algorithm
* **Thought of sharing this, incase if it helps - ML is all about finding the appropriate patterns hidden in the data and use the same to predict! Distribution helps us to find what pattern ( or in here its Distribution ) the Sample is following! The more accurate we are in finding the exact distribution the more chances are we get better accuracy for a model.**

A **network delay** is the amount of time required for one packet to go from its source to a destination. It is also called the **end-to-end delay**, and it comprises the following 4 types of delays:

* Transmission delay
* Propagation delay
* Queuing delay
* Processing delay
* End-to-end delay=Tt+Tp+Tq+Tpr (Tr(Transmission delay)=L(bits)/R(bit/sec)); Tp(propagation delay)=d(distance or link length)/s(propagation speed);queuing and processing delay depends on system

An empirical probablility, also called an experimental probability, is **closely related to the relative frequency of an event**. Empirical probability uses the number of occurrences of a given outcome within a sample set as a basis for determining the probability of that outcome occurring again.

|  |  |  |
| --- | --- | --- |
| **Find-Regression-Heuristics****begin** | // the function that discovers regression heuristics of the metrics adapted, the set  represents the empirical probabilities of the metric value of the transmission time intervals | |
|  | | // Find the empirical probability of the given metric value of the all transmission time intervals range j=1,2,…, . |
|  | | //Finding the deviation of empirical probability of the metric values. |
|  | | // the absolute distance of the empirical probability and respective deviation of the empirical probability is the lower bound of the metric values |
|  | | // the aggregate of the empirical probability and respective deviation of the empirical probability is the upper bound of the corresponding metric. |
| Return | | // returns the regression heuristics, and respective lower and upper bounds |
| End | |  |

# **TARGET CELL SELECTION CRITERIA**

select the target cell during handover process, the proposed model performs the discriminative rank allocation strategy, which is as follows

The carrier that initiating the handover process allocates a rank for each neighbour cell, such that each target cell ranked as 1, 2, 3, or 0 for each quality metric adapted.

In this regard each target cell entails divergent ranks for divergent metrics under the expected metric value of the triggered time interval, which is as follows

For each target cell,

* + 1. if the expected value of a metric is lesser than the regression heuristic that indicates the lower bound of the metric values, then ranks as 0,
    2. if greater than the lower bound and lesser than the regression heuristic that represents empirical probability of the metric values, then assigns rank 1,
    3. if greater than the empirical probability, and lesser than the regression heuristic representing the upper bound of the metric value, then assigns rank 2,
    4. or if the expected metric value is greater than the upper bound of the metric values then ranks the target cell as 3for the corresponding metric.

Further, for each target cell, discovers the root mean square errorof the ranks allocated. In order to finalize the target cell towards handover process. Further, the target cells has to sorted in ascending order of the prime metric handover failure rate (HFR), further selects recommends the target cells in ascending order of their root mean square error.

What is probability of blocking?

The blocking probability is the dominant parameter used for effective network design and network planning. It is defined as **the probability of service being denied to users due to the non-availability of radio resources** and is determined from the number of available channels and traffic load in Erlangs.

With the rapid progress of 3GPP LTE/LTE-A's standardization, research about coordinate multi point reception / transmission (CoMP) is very popular. However, topics about CoMP were freezed in around 2009 by 3GPP, so further research and performance analysis about key techniques in CoMP is very little.