Enhance Mobile Using Real-Time Multi Attribute LTE Placement and Radiation Minimization Algorithm

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Abstract

Electromagnetic radiation (ER) is reduced by the placement of LTE in the transmission path of an antenna. The selection of route among antennas estimates the shortest path for transmission of signal or data with low radiation. Current devices are located with MIMO antennas with LTE placement for minimizing the radiation to improve the signal strength with higher data transmission in wireless network communication. A proposed paper describes various parameters and the design of real time multi-attribute LTE placement and radiation minimizing algorithm (RMLPRM).The transmission path which has a various parameters for communication and that list the routes to estimate the multi-attribute transmission strength measure (MTS) value for each route. Higher MTS value with single direction of transmission range has been selected for data communication. Thus improves the performance of quality of service (QoS) network with higher data rate and higher throughput performance that reduces the radiation.

Keywords: LTE placement, multi-attribute transmission strength, quality of service, RMLPRM.

1. Introduction

In wireless communication data transmission between the intermediate nodes and source node or destination emits radiation highly. The electromagnetic radiation introduces when two node shares the frequency or perform communication in the same frequency their radio signals gets overlapped in wireless media. Thus the radiation in wireless communication is impacted by the angle of antenna (AoA) and the frequency of data transmission through different transmission. Using routing algorithm the selection of route between intermediate nodes and the placement of LTE can be controlled the radiation. The performance and the placement of LTE antenna minimize the radiation in network using proposed technique and methods are represent in this letter. The LTE supports high quality data transmission which is required by modern internet application. The previous networking technology does not support the higher data rate applications due to higher delay parameters but fourth generation network supports high quality data transmission through various online services to enhance network communication is depending on different factors such as distance or length of transmission, throughput performance, number of LTE presents, traffic rate, bandwidth utilization and minimize radiation. The LTE placed between two nodes that varies the length of transmission and produce the frequency of radiation energy different for each route. To obtain higher data transmission with low frequency range of energy improves the quality of service in wireless network communication.

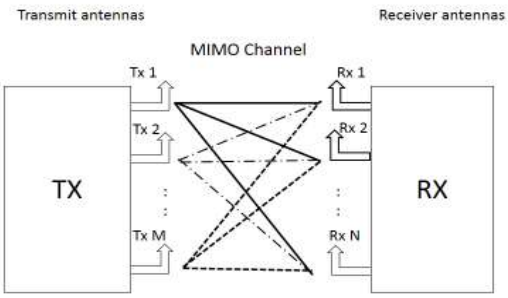

Fig1 MIMO antenna block diagram

The MIMO antenna which has m number of transmitter antenna which can communicate with n number of receiver antenna for transmission is shown in figure-1. For efficient transmission the presence of LTE in the route between source and destination should be higher. The 2^m possible connection can be identified between any two neighbor nodes of the mobile network and the number of LTE is less or the hop count is high what happens in the transmission is the radio energy has been transmitted in the frequency which gets overlap on other transmission or radio wave boundary. This is considered as radiation and affects the communication of other node transmission. Similarly the possible connection between the source node and the base station or the destination node with high number of LTE in route emits the low radiation and thus improves the throughput performance. The distance between the source and the base station or the destination node makes higher impact in the quality of service of the network. If the destination node is very close or it is located in the transmission range of the same base station where the source is present, the packets will be delivered to the destination within short delay, this increases the throughput performance and reduces the packet drop ratio. But, when the nodes are located under different base station coverage, then the source node has to involve in discovering the route and select a route based on some parameter. However, there will be delay in the packet delivery which affects the performance of throughput and packet delivery ratio. So the distance between the source and destination node makes a higher difference and also impacts the quality of service of the network. In case the presence of higher distance or transmission length between nodes that exist has a high traffic rate. The data transmission in multiple routes the traffic condition varies and it is necessary to choose the route with higher bandwidth. By electing high bandwidth with low traffic rate routes, the QoS can be improved.

All these parameters have to be considered for LTE placement and route selection towards the development of the network.

2. Real-time Multi Attribute LTE Placement for radiation minimization

The system identifies the list of base stations and list of LTE systems and number of intermediate nodes available. The method estimates various factors like path transmission weight, LTE transmission weight, and base reachable weight for different paths. Similarly the method computes the traffic rate, bandwidth utilization, and distance factors for different routes and LTE. Using both the information, the method performs LTE placement and chooses a route to reach the base station and destination.

For example the figure -2 shows the number of base stations presents and delivers the data with high frequency to reach the destination. The receiver receives the signal with high data frequency by nearby base station. The multiple BS presents for uplink and downlink processes to communicate the receiver and frequency data computed as bits per second. The tower transmits and receives the signal gradually, the receiver device selects the neighbor station for worthy communication without noise. Consider the receiver device choose any one of the base stations BS1, BS2 or BS3.The signal frequency between the base station and receiver has low which delay the data transfer communication.

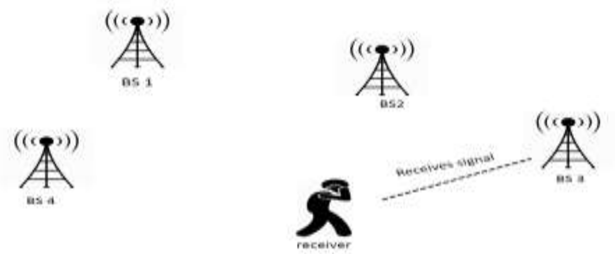

Fig 2. Shows number of base station which has a high signal strength to receive by receiver.

Consider the BS3, the receiver device selects the tower 3 for communication. The device receives the signal with high frequency with no communication delay and low traffic rate. The throughput performance gradually increased by receiving the signal from the neighboring station without any interrupt transmission resulting in the quality of communication service.

2.1. RMLPRM Routing Algorithm

2.1.1. Estimation of Route Selection

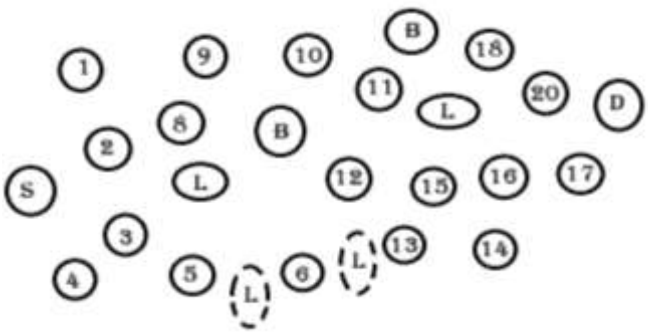

Fig- 3. LTE network

The figure-3 shows the topology of the network after the LTE placement in different locations. This illustrates the list of routes available and the presence of LTE and base stations in the network. The high traffic rate with low throughput performance for data communication attains no presence of LTE antenna in network. The dotted node represents the network after the placement of the LTE antenna for data transmission. The presence of LTE between the nodes for different transmission routes to gain higher quality performance.

Table-1 Routes from source to destination

Routes From Source To Base Station	Routes From Base Station To Destination
1-9-B	B-B-18-20-D
2-8-B	B-B-L-20-D
2-3-L-B	B-1-L-20-D
4-3-L-B	
4-3-5-6-13-12-B	
2-8-9-B	

Table -1 shows the list of routes available between the source node to base station and the base station to destination node where the destination node is located under another base station. The source node identifies the list of routes towards the base and the destination in this stage. It has been performed by generating the RREQ message with the destination of base station id. The neighbor node in turn receives the packet, it verifies whether the node is located within the transmission range of the base station or is connected with the LTE. If the node is connected through an LTE it generates the route reply or it is directly covered in the base station, then also a reply has been generated to the source node. The source node in turn receives the route reply and extracts various information from the route reply. The source node extracts the total number of LTE present in the route, the number of intermediate nodes, and number of base stations available around the routes. All these information are available in the route extracted and that has been indexed to the route table.

2.1.1 (a)Pseudo Code of Route Discovery:

Input: *Route Table RT*

Output: *Route Table RT*

Start

Generate Packet P.

Generate RREQ = {RREQ, Source ID, Base Station ID}

Broadcast in network.

Intermediate node receives the packet P.

If Destination ID or Base Station ID is under the reachability of intermediate node then

Generate RREP

Else if Neighbor is LET then

Generate RREP

Else if Base Station is Reachable but other Base Station then

Generate RREP

Else

Forward Packet to neighbor.

End

Receive Route reply RREP

Extract list of routes RouteList=$\int_{i=1}^{All\ RREP\ Received} Route \in RREP$

Add to route table

RT=$\sum(Routes \in RT) \cup (\sum Routes\ RouteList)$

Stop

The above discussed pseudo code represent the working principle of route discovery algorithm performed to support the LTE placement.

The estimated route support measure has been used to perform route selection. The route support measure represents the suitability of the route in achieving higher data rate and achieving good routing performance.

2.1.1 (b)Pseudo Code of Route Support Estimation:

Input: *Route R*

Output: *RS*

Start

Read route R

Identify number of LTE present NLTE =$\sum LTE \in R$ ----------- *(1)*

Identify number of intermediate nodes Ninode =

$\sum Bluetoothnodes \in R$ ---------------- *(2)*

Compute Route Support RS=$(\frac{LTE}{size(R)} \times \mu) \times (\frac{Ninode}{size(R)} \times \beta)$ -------- *(3)*

Stop

Where $\mu - Distance\ of\ base\ station\ from\ LTE$

$\beta - \ Distance\ of\ base\ station\ from\ source$

For example consider the route "2-3-L-B" to measure route support value as follows,

Number of LTE present in the route NLTE=1

Number of intermediate nodes present in the route Ninode =2

Compute Route Support RS=$(\frac{1}{3} \times 0.6) \times (\frac{2}{3} \times 0.8)$ =0.096

Similarly the RS measure can be measured for any route identified and based on that the LTE placement has been performed. The value of the RS is less than considerable threshold value, the method performs placement of LTE.

2.1.1 (c) Pseudo Code of RMLTE Placement:

Input: *Route Table RT*

Output: *Null*

Start

Read route table RT.

For each route r

Compute number of nodes Nn=$\int \sum Nodes \in r$ ------ *(4)*

Compute distance with base station

Dbs = $\sum_{i=1}^{NN} Dist(r(i), r(i+1))$------------- *(5)*

Compute route support RS=Route support estimation (r)

If rs < Rsth then

Rsth - route support threshold

Identify location LIoc $=\frac{Dbs}{2}$ ---------- *(6)*

Deploy LTE in location LIoc

End

End

Stop

Real time multi attribute LTE placement algorithm defines the method to choose the route based on the value of the route support and route threshold. The location of the LTE has been selected based on the distance between the intermediate nodes which transmits the data from base station to source node. This supports the transmission of data packets in an efficient way towards the destination.

From figure 3 consider the route "4-3-5-6-13-12-B" which has the hop count of 7 and the RS would be less than the threshold, then LTE placement has to be performed. For this the LTE can be deployed in the between 5 and 6 or 6 and 13 that changes the network topology. This algorithm would improve the data rate and performance of data delivery to enhance the network communication.

2.1.2. Multi-attribute Transmission Strength Measurement

Multi-attribute transmission strength is the measure which represents the strength of the route for communication. As there are a number of routes to reach the base station and it is required to choose the efficient route for data transmission. Each route has a number of intermediate nodes and multiple inputs & outputs with MIMO antenna. The transmission strength of the route is highly dependent on the angle of antenna (AoA), distance, the presence of LTE and Bluetooth devices and so on. Consider the route R has K number of intermediate nodes among them, I number of intermediate nodes are Bluetooth devices and there exist t number of LTE, then the transmission strength of the route and the other parameters has been measured as follows,

2.1.2 (a) Pseudo Code on MTS Estimation:

Input: *Route R*

Output: *MTS*

Start

Read route R

Compute data rate support

$$DRS=\frac{NO\ of\ LTE}{Hopcount}\times \Omega \qquad \text{----------------------- (7)}$$

Here Ω constant on data rate with LTE

Compute throughput support

$$THz=\frac{Distance(s,Bs)\times no\ of\ LTE}{Hopcount} \qquad \text{------------- (8)}$$

Compute Bandwidth support

$$Bands=\frac{\sum_{i=1}^{size(R)} Bandwidth(R(i)\rightarrow R(i+1))-Traffic(R(i)\rightarrow R(i+1))}{Hopcount(R)} \qquad \text{---- (9)}$$

Compute Radiation factor

$$Rf=\frac{\sum_{i=1}^{size(R)} Traffic(R(i)\rightarrow R(i+1))}{Hopcount(R)}\times \alpha \qquad \text{---------- (10)}$$

Here α –bit traffic

Compute Multi-attribute transmission strength

$$MTS=\frac{Drs}{Bands}\times\frac{Ths}{Bands}\times\frac{1}{Rf} \qquad \text{---------------- (11)}$$

Stop

According to MTS value the proposed algorithm selects a single route to perform the communication and improves the quality with higher data rate by reducing the radiation from different data transmission.

3. Results

The output performance of mobile with LTE technique plots as graph. In the graph, the value of signal to noise ratio (SNR) as shown. The receiver receives the signal from a proper or nearby base station which has a multiple base station. While receiving the signal strength the ratio of noise is evaluated. If the device selects a remote or distant base station means noise and data delay are present. The device selects the nearby base station means without SNR and interrupt data delivery transfer, it controls traffic which produces high radiation. The minimum value of noise produces the high signal strength and receives a quality output with low radiation.

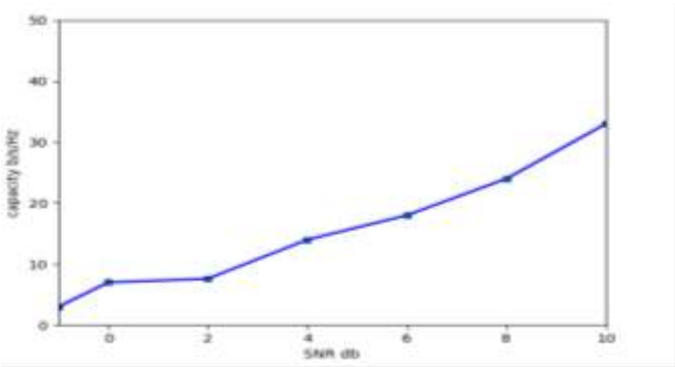

Fig 4. *SNR vs Capacity*

The figure-4 plots a graph between noise ratio and capacity which is denoted by hertz. The communication network shows the frequency of the channel device and gains a low frequency computed as bits per second or Hertz by using this technique. Various increasing level of throughput is shown in table - 2.

Table-2 Simulation Vs Throughput

Simulation time	**Throughput**
100	810
125	870
150	780
178	800
200	850

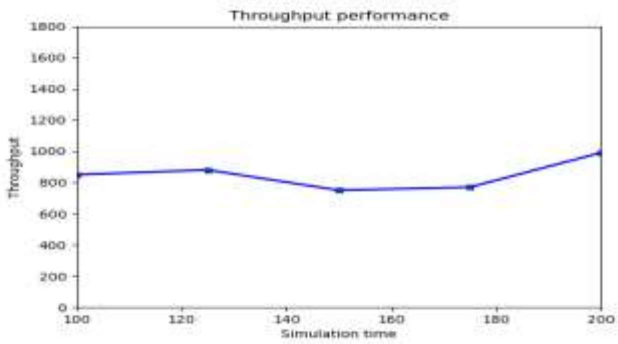

Fig.5 *Throughput vs simulation time*

The figure-5 shows the performance of throughput taken from bits per second received packet. RMLPRM algorithm analyzes the parameters of communication devices and evaluate the throughput value. The data delivery with no delay the downlink or receiving signal increase the throughput performance with low radiation .The present protocol has high signal strength with low traffic rate and increases the throughput values to enhance the quality of mobile communication.

4. Conclusion

Recently cellular bands have MIMO antennas with multiple inputs and outputs for data transmission in the network for 4G internet application. The energy radiates the signal while transferring the data among the network system. The algorithm Identifies the list of routes and each route has multiple attributes to measure the signal strength. The LTE technique supports high data rate application based on various parameters such as the present and the placement of LTE antenna, the distance between intermediate nodes or any other transmission media. This letter presents a real time multi-attribute LTE placement and radiation minimization algorithm towards the development of QoS of mobile ad-hoc. In data transmission the low traffic rate with high bandwidth utilization then the performance of the throughput can be increased. Thus the method reduces the radiation to improve the quality of network service.

Author Contributions

GokulaChandar.A (Ph.D. student) contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript.

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