IJIREEICE

ISSN (Online) 2321 – 2004
ISSN (Print) 2321 – 5526

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN ELECTRICAL, ELECTRONICS, INSTRUMENTATION AND CONTROL ENGINEERING
Vol. 4, Issue 4, April 2016

On Performance Improvement of Wireless Push Systems Using Smart Antennas

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Abstract: In wireless telecommunication, the network consists of a broadcast server with a set of clients. It sends a group of information to the clients in a desired closed loop path. According to the information send by the broadcasting server the clients access it this should be happen in a cyclic path. In olden days we use fixed directional antennas for transmitting the signal from one place to another. Due to some drawback over the existing one we use multiple directional antennas at the Broadcast Server has been shown to increase performance. In many cases however, such broadcasting systems fail to exploit the full potential of the multiple antennas as they do not take into account the geographical distribution of clients within the coverage area of the system. This Thesis proposes an adaptive smart antenna based wireless push system where the beam width of each smart antenna is altered based on the current placement of clients within the system area. Coupled with a modification of the broadcast schedule, the proposed approach significantly increases the performance observed by the system clients.

Keywords: Smart Antenna, Wireless Communications, Clients.

I. INTRODUCTION

Wireless telecommunications refers to the transfer of information between two or more points that are not physically connected. Distances can be short, such as a few meters for television remote control, or as far as thousands or even millions of kilometers for deep-space radio communications. It encompasses various types of fixed, mobile, and portable applications, including two way radios, cellular telephones, personal digital assistants (PDAs), and wireless networking. Telecommunication is the science and practice of transmitting information by electromagnetic means. Communication is talking to someone or thing not necessarily through technological means.

Telecommunication, however, is talking through technology meaning phones, Internet, radio etc... In earlier times, telecommunications involved the use of visual signals, such as beacons, smoke signals, semaphore telegraphs, signal flags, and optical heliographs, or audio messages such as coded drumbeats, lung-blown horns, and loud whistles.

In modern times, telecommunications involves the use of electrical devices such as the telegraph, telephone, and tele-printer, as well as the use of radio and microwave communications, as well as fiber optics and their associated electronics, plus the use of the orbiting satellites and the Internet. Data broadcasting is the broadcasting of data over a wide area via radio waves. It most often refers to supplemental information sent by television stations along with digital television, but May also be applied to digital signals on analog TV or radio. It generally does not apply to data which is inherent to the medium, such as PSIP data which defines virtual channels for DTV or direct broadcast satellite systems; or to things like cable modem or satellite modem, which use a completely separate channel for data.

The main goal of my project is to propose the use of smart antennas at the BS. The ability of smart antennas to alter their beam width is exploited so that the coverage of each antenna is adapted according to the current placement of clients within the system. And also we fulfill the client requirements calculated using some probability updating algorithms and Broadcasting algorithms. To obtain this goal we have to calculate the probability of distribution among the user. And also calculate the mean response time for the entire group or various numbers of groups present in the system.

The rest of this brief is organized as follows. Literature Survey is presented in section II. Existing system is presented in Section III. The proposed system is presented in Section IV and the performance evaluation is presented in Section V. The simulation result is given in Section VI. The conclusion is in Section VII.

II. LITERATURE OF SURVEY

Pull based system consist of broadcasting server and group of clients they are connected via channel. In this system the server only broadcast the information that is demanded by the clients. These types of system also consist of client server and a group of clients. The server broadcast the common information to all the clients present in the system. By using the push based systems all clients presented in the system should receive common information, and should not perform any queries about the information. By comparing with pull based system, push systems are mostly used in telecommunications for transferring information to the clients. The main advantage of push based system over the pull system is initialization cost. In the push based system the broadcasting information should be arrange by their weights due to some advantage over these type of weights we proposed

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Vol. 4, Issue 4, April 2016

some algorithms for reducing this kind of broadcasting problems. So all low cost broadcasting algorithms are used push type of system for transferring information to the clients.

○ ADAPTIVE DATA BROADCASTING

In underwater communication we introduced another technology namely 'Adaptive data broadcasting' for providing the client demands. The word 'Adaptive' represents that the broadcasting schedule should be changed according to the situation or else according to the client demands. It should be achieved by using Learning Automaton (LA). This tool mainly used to find the client demands in the underwater communication. Many types of underwater wireless networks use push based systems for its communication to transfer the information from the broadcasting server to the clients who are presently in the group.

○ WIRELESS DATA BROADCASTING

In this concept we are mainly discussing about the wireless data broadcasting. The data broadcasting system consists of one broadcasting server and a group of clients. The main work of broadcasting server is to provide the suitable information to the clients. This should be done by arranging the broadcasting schedule according to the client demands. This should be done by various types of algorithms. In this paper we mainly discuss about the analytic work for arranging the broadcasting schedule according to the client demands by using various algorithms. By using these techniques the response time of the clients should be minimized.

○ CLUSTERING-DRIVEN WIRELESS DATA BROADCASTING

The performance of a push-based system relies heavily on the proper scheduling of the broadcast data. To this end, the Broadcast Disks method is most commonly employed. It defines a procedure consisting of four separate algorithms: one to provide and handle the clients' feedback, another to group the data objects into disks, a third one to define their spinning velocities, and finally a Broadcast Sequence constructor algorithm. In this article we introduce and evaluate Clustering-Driven Wireless Data Broadcasting (CWDB), a complete instantiation of the Broadcast Disks method. This paper proposes an adaptive push-based system. It suggests the use of a learning automaton at the broadcast server to provide adaptively to an existing push system while maintaining its computational complexity. Using simple feedback from the clients, the automaton continuously adapts to the client population demands so as to reflect the overall popularity of each data item. Simulations results are presented that reveal the superior performance of the proposed approach in environments with a priori unknown, dynamic client demands.

III. EXISTING SYSTEM

The Directional antennas are used in communication systems for transferring information to the clients according to their needs. The yagi-uda antenna and dipole antenna are some of the antennas used for communication purpose. In the existing system uses the directional antennas with fixed beam width. The main drawback of this kind of antennas are fail to exploit the full potential of the multiple antennas as they do not take into account the geographical distribution of clients within the coverage area of the system, and also we cannot alter the beam width according to the client's need. Due to the fixed beam width in directional antennas the some of the antennas handle more number of clients and some of them handle less number of clients this makes the distribution among the clients not-uniform, and also we cannot fix a set of clients to it.

○ DISADVANTAGES IN EXISTING SYSTEM

- Less throughput.
- Beam width used here is fixed.
- The distribution among the clients is not uniform.
- Output performance is less.

IV. PROPOSED SYSTEM

Due to some disadvantage over the existing system we propose another technique called smart antennas with rescheduling application. The use of multiple directional antennas at the Broadcast Server has been shown to increase performance. In many cases however, such broadcasting systems fail to exploit the full potential of the multiple antennas as they do not take into account the geographical distribution of clients within the coverage area of the system.

This Thesis proposes an adaptive smart antenna based wireless push system where the beam width of each smart antenna is altered based on the current placement of clients within the system area. Coupled with a modification of the broadcast schedule, this should be done by using learning automaton tool on the broadcasting server side. The proposed approach significantly increases the performance observed by the system clients.

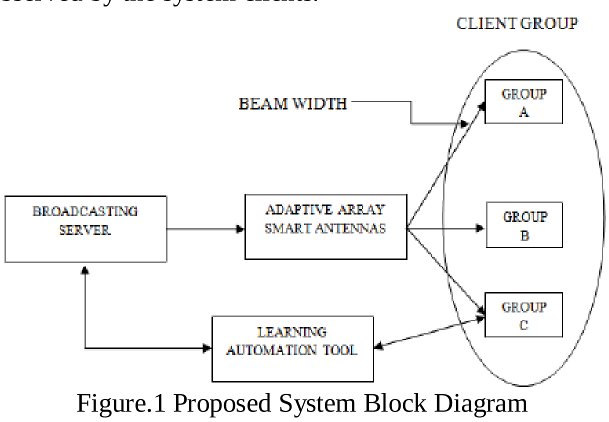

Figure.1 Proposed System Block Diagram

In this paper we are mainly discussing about the multi directional broadcasting this should be done by providing smart antennas at the broadcast server. Each broadcast server consist of a number of smart antennas, it is mainly depends upon the number of clients present in the system. And also we fulfill the client needs according to their requirement. This should be done by using learning automaton tools on the broadcast server. The information is sent by the broadcasting server should be arranged in a specific format. According to the client response it should be rearranged, this should be done by various type scheduling techniques. By using these kinds of techniques we fulfill the client's requirements and also provide the uniform distribution among all users present in the group.

○ MODULES

▪ SYSTEM CHARACTERISTICS AND BROADCASTING ALGORITHM

In this module we have to design the basic system that consists of one broadcasting server and N number of clients. According to the population the clients are divided into several numbers of groups. Broadcasting server uses multiple antennas for transmitting the signals to the clients. According to the number of clients the antennas used on the broadcasting server should be changed. Basic system consists of a broadcasting server and a group of clients. According to the number of clients antennas used at the broadcasting server should be changed.

In this system we have to use smart antenna for the transmission of information to the clients. The main use of these kinds of antennas is they accept signal from all direction and also they adjust their beam width according to the client's location. It should be more advantage over the existing system. We introduce an technique called Learning Automaton tool. This tool is mainly used to find the client requirement. Because the system used here is push in nature. So the clients want to demand their requirement to the broadcasting server. This should be carried out by using these types of tools at the BS. The information sent from the BS to clients as a control packet, each information's present in the broadcasting server should be arranged in a specific format according to their characteristics, they are said to be "Broadcasting Schedule". After the information sent by the broadcasting server it should be accessed by the group of clients, according to their response the broadcasting schedule should be arranged by using the learning automaton tool present in this system. In the multiple antenna wireless push system each antenna is equipped with a LA that contains the server's estimate *pi* of the demand probability *di* for each data item *i* among the set of the items the antenna broadcasts.

$$\sum_{i=1}^{N} p_i = \sum_{i=1}^{N} d_i = 1 \qquad \ldots\ldots\ 2$$

Where N is the number of items in the server's database

The server estimates the next transmission by using the cost function present in this system. The cost function mainly used to find the next transmission, by comparing the current transmission with the previous transmission.

$$G(i)=(T-R(i))^2\, p_{i/li}\, ((1+E(l_i)/1-E(l_i)) \quad \ldots..\ (3)$$

In this cost function, T is the current time, R(i) the time, when item i was last broadcast.*li* is the length of item *i* and E(*li*) is the probability that an item of length *li* is erroneously received. For items that haven't been previously broadcast, R is initialized to -1. If the maximum value of (*i*) is shared by more than one item, the algorithm selects one of them arbitrarily.

Upon the broadcast of item *i* at time T, *(i)* is changed so that R(*i*) = T. Where 'l' is the length of the item should be broadcast by the server. The length of the item should be calculated by using the equation (4).

$$l_i = round\left(\left(\frac{L_1 - L_0}{M-1}\right)(i-1) + L_o\right), 1 \le i \le M \quad \cdots\ (4)$$

Where L1 and Lo are the parameters are used to characterize the distributions, 'i' is the number of items present the system. Round () function used to give the rounded integer value at the output.

The information sent by the broadcasting server should not be sent for a single time, it should be repeated according to the requirements. Entire operation present in the system should be working in a cyclic way. So we have to find the number of cycles that the program has to be executed and is given in equation (5),

$$N = \sum_{i=1}^{N} f_i l_i \qquad \ldots\ldots\ (5)$$

Where the spacing between the information arranged in the broadcasting schedule should be calculating by using the equation (6),

$$S_i = \frac{N}{f_i} \qquad \ldots\ldots\ (6)$$

Frequency of an item should be find by using the below equation (7),

$$f_i = \left(N\sqrt{p_i / l_i}\right) / \left(\sum_{j=1}^{M} \sqrt{p_i l_i}\right) \qquad \cdots\cdot(7)$$

And the mean access time of the entire system for both fixed and smart antennas are given below in equation (8).

$$T_{opt} = \frac{1}{2}\left(\sum_{i=1}^{M} \sqrt{p_i l_i}\left(\frac{1+E(l_i)}{1-E(l_i)}\right)^{1/2}\right)^2 \qquad \cdots\ (8)$$

Where E(*li*) is the length of the item that are received erroneously by the clients and they are given by,

$$E(l_i) = 1 - e^{-\lambda l_i} \qquad \ldots(9)$$

▪ PROBABILITY UPDATING SCHEME

Learning automata are mechanisms that can be applied to learn the characteristics of a system's environment. A learning automaton is an automaton that improves its performance by interacting with the random environment in which it operates. Its goal is to find among a set of M actions the optimal one, so that the average penalty received by the environment is minimized. This means that there exists a feedback mechanism that notifies the automaton about the environment's response to a specific action. The operation of a learning automaton constitutes a sequence of cycles that eventually lead to minimization of average penalty. The learning automaton uses a vector,

$$P(n) = \{p_1(n), p_2(n), \ldots\ldots\ldots, p_M(n)\}$$

This represents the probability distribution for choosing one of the actions a1, a2... aM at cycle.

DOI 10.17148/IJIREEICE.2016.4462

$$\sum_{i=1}^{M} p_i(n) = 1 \quad \cdots\cdots \quad (10)$$

The core of the operation of the learning automaton is the probability updating algorithm, also known as the reinforcement scheme, which uses the environmental response triggered $\beta(n)$ by the action *ai* selected at cycle 'n' to update the probability distribution vector 'p'. After the updating is finished, the automaton selects the action to perform at cycle n+ 1, according to the updated probability distribution vector P (n+1).

$$P_{z,j}(K+1) = P_{z,j}(K) - L(1-\beta_z(K))(P_{z,j}(k)-a), \forall j \neq i \;\ldots\ldots\ldots(11)$$

$$P_{z,j}(K+1) = P_{z,j}(K) + L(1-\beta_z(K))\sum_{j\neq i}(P_{z,j}(k)-a) \rightarrow 1\ldots(12)$$

Where are $P_{z,i}(K) \in (a,1)\ \forall\ i \in [1..N]$, L, $a \in (0\ldots1)$ parameters of the LA. L defines the rate of convergence, while the role of α, is to prevent the probabilities of non-popular items from taking values very close to zero in order to increase the adaptivity of the LA.

○ **ADVANTAGES PROPOSED SYSTEM**

- ✓ Antenna beam width is not fixed.
- ✓ System performance is significantly increased.
- ✓ Client requirements should be fulfilled.
- ✓ Multi- directional signal accessing is possible.

V. PERFORMANCE EVALUATION

In this module we make some performance calculation, system performance should be concluded by calculating the mean response time. Mean response time is the mean amount of time units that a client has to wait until it receives a desired information item. We consider antennas having replicas of the same database of equally sized items. The antennas are initially unaware of the demand for each item, so initially every item has the same probability estimate.

Client demands are a-priori unknown to the server and location dependent. We consider *Numcl* clients that have no cache memory, an assumption also made in other similar research; Clients are grouped into G groups each one located at a different geographical region. Any client belonging to group g, 1 ≤ g ≤ G, is interested in the same subset *Secg* of the server's database. All items outside this subset have a zero demand probability at the client.

The items broadcast are subject to reception errors at the clients, with unrecoverable errors per instance of an item occurring according to a Poisson process with rate *lamda*. In this model we mainly calculate the system performance for both fixed and mobile users for various numbers of antennas. The system performance should be calculated by the mean response time of the group.

VI. SIMULATION RESULTS

In this chapter we are discussing about some graphical representation of the system performance. Mean response time for various numbers of fixed antennas is compared with the smart antennas. In figure 2, As compared to fixed antennas, smart antennas are providing uniform distribution among the group of clients.

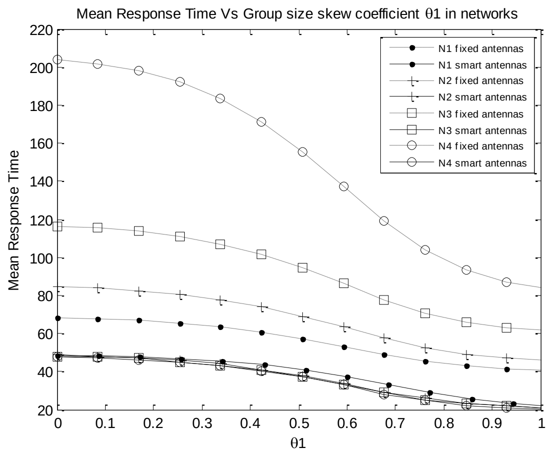

Figure.2 Fixed antennas Vs Smart antennas

Next to comparison we can change the number of networks present in the system and we can check the system performance by calculating their corresponding mean response time. Here we consider five networks that use fixed antennas or smart antennas for its transmission. We compare the simulation results by using both antennas. The results are described in Figure 3

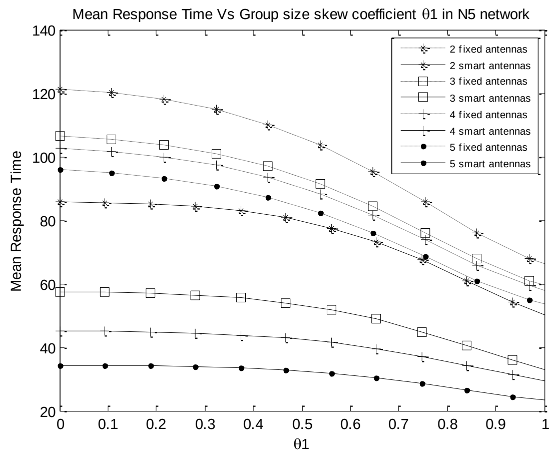

Figure.3 Fixed Antennas Vs Smart antennas
(Five Networks)

In figure 4 we are discussing about the six networks that are using the smart antennas or fixed antennas for its transmission. And we compare the results by calculating the corresponding mean response time.

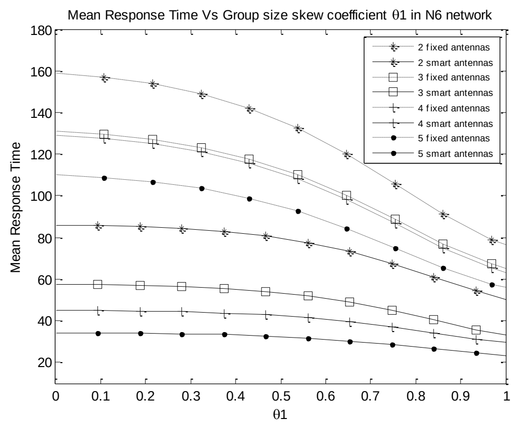

Figure.4 Fixed Antennas Vs Smart Antennas
(Six Networks)

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In figure 5 we are check the performance for various types of distributions. We use three different types of distribution techniques; they are uniform distribution, Poisson distribution, Gaussian distribution and Zipf distribution. And make this calculation we can check the performance of the entire system.

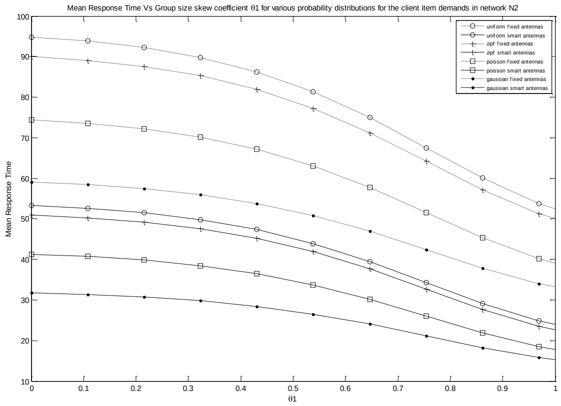

Figure.5 Fixed Antenna Vs Smart Antenna with Different Distributions

In figure 6 we are check the performance for mobile clients. In this literature we are mainly discussing about both the fixed and the mobile users. So in this section we are discussing about the mobile clients.

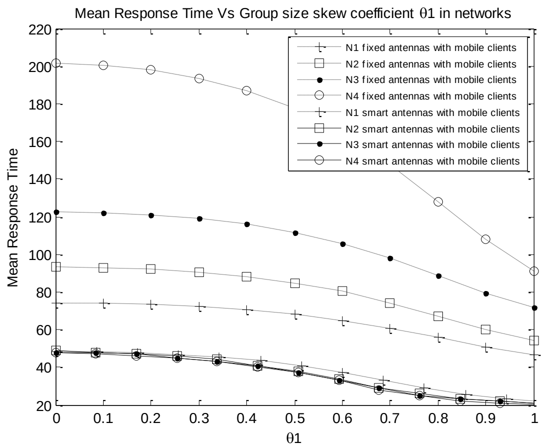

Figure.6 Fixed Antenna Vs Smart Antenna with Mobile Clients

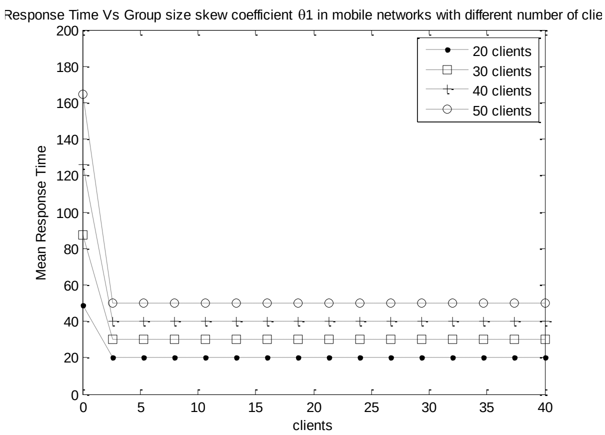

Figure.7 Fixed Antenna Vs Smart Antenna with Different number of Clients

we are check the performance for different number of clients. In this literature we are mainly discussing about both the fixed and the number of users. So in this section we are discussing about the different number of users in fixed and smart antenna condition.

In this Thesis we are mainly compare the results of fixed type antennas and smart type antennas for various conditions. We extend the results; we can check the performance for various numbers of clients. By using this condition we can check the performance for various numbers of clients who are present in the particular antenna.

By using this enhancement we have to check the transmission for individual clients, So that we can calculate the performance of the entire system. For implementing this concept we have to develop a common system that is already present in the previous section. After that we have to change the number of clients present in that particular antenna. So after finding the results we are checking the zipf distribution for corresponding group size coefficient.

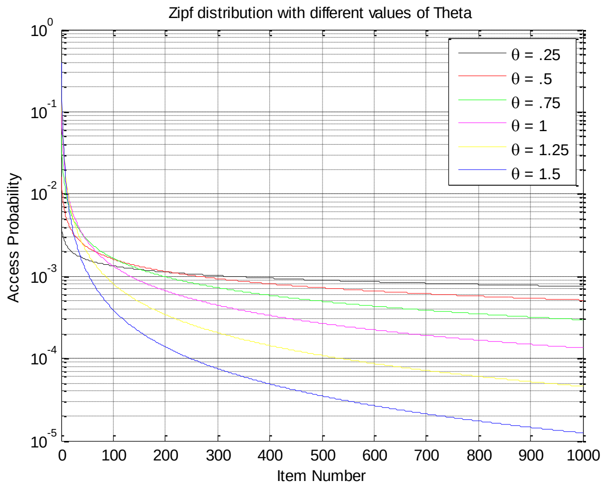

Figure.8 Zipf distribution with different values of Theta

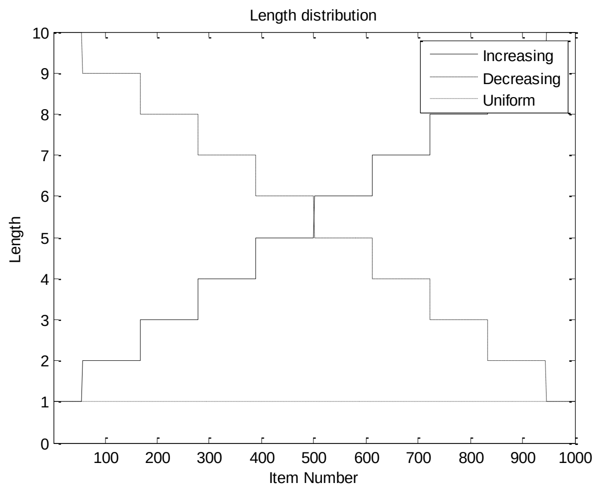

Figure.9 Length distribution

VII. CONCLUSION

This Thesis proposed an adaptive smart antenna-based wireless push system where the beam width of each smart

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ISSN (Print) 2321 – 5526

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN ELECTRICAL, ELECTRONICS, INSTRUMENTATION AND CONTROL ENGINEERING
Vol. 4, Issue 4, April 2016

antenna is altered based on the current placement of clients within the system. After the antenna assignment procedure, each antenna excludes from its broadcast schedule the information items that refer to geographic areas that are out of its coverage. Simulation results reveal that the above-mentioned properties of the proposed system provide a significant performance increase over the system of that utilizes multiple antennas of fixed beam width.

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BIOGRAPHIES

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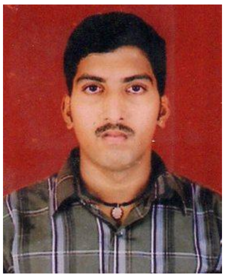

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