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RESEARCH ARTICLE

A Novel Improvement in Wireless Networks by Using Wireless Push System through Smart Antennas

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Abstract: In wireless communication, 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 sends by the clients. In olden days we use fixed directional antennas for transmitting the signal from one place to another. In some times the fixed directional antennas at broadcast systems may fail to give the services to clients due to its fixed beam width and location of client. So in this paper we introduced a novel Improvement in wireless push system by using smart antenna where beam width of each smart antenna is altered based on location of the clients. So that we give better services to clients by using smart antennas.
Keywords: broadcast server, fixed directional antenna, beam width, wireless push system

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 things 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.

II. OBJECTIVES

The main goal of 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. By using smart antennas we can achieve the high through put and reliability of network and also we can increase the performance of network by using smart antennas..

III. EXISTING SYSTEM

The Directional antennas are used in communication systems for transferring information to the clients according to their needs. The yage-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.

IV. DISADVANTAGES OF EXISTING SYSTEM

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

V. 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.

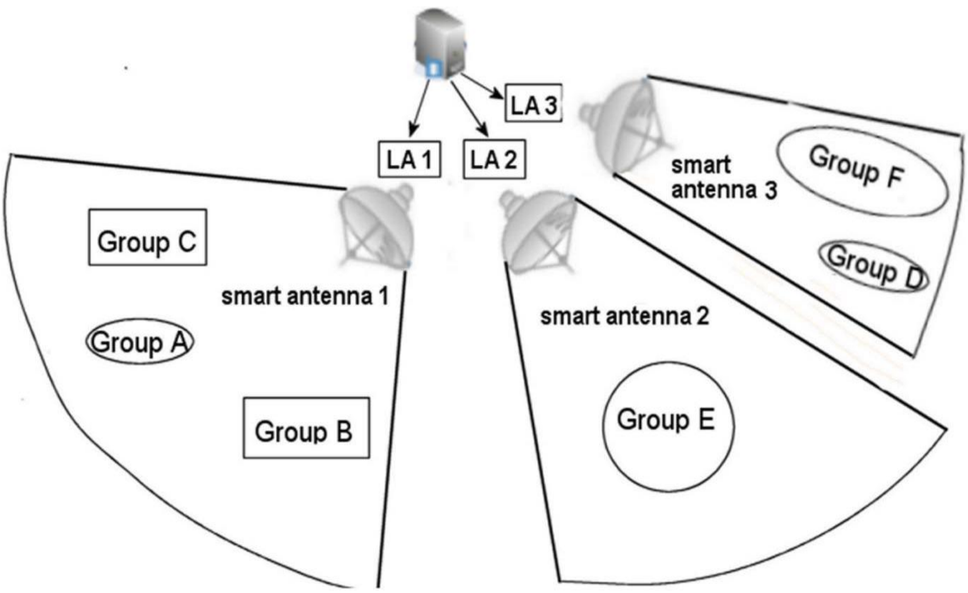

Fig. 1. Example of the proposed systems topology

This letter 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 in anywhere in the place.

VI. PROPOSED SYSTEM TECHNIQUES

A. Learning Automaton

A learning automaton is an adaptive decision-making unit situated in a random environment that learns the optimal action through repeated interactions with its environment. The actions are chosen according to a specific probability distribution which is updated based on the environment response the automaton obtains by performing a particular action.

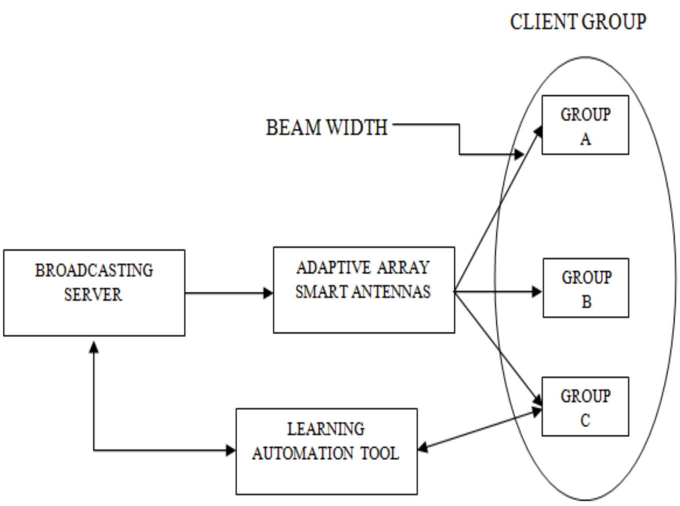

Fig.2 Proposed System Block Diagram

Learning Automation (LA), whose probability distribution vectors determines the popularity information item among the clients in service area of the antenna. The figure that represents the operation of the Learning automation is given below. By using this technique the system can find the popularity information, and it excludes the items that are never demanded by the clients in the coverage area of the antenna.

B. Beam Forming

Beam forming can be used for radio or sound waves. It has found numerous applications in radar, sonar, seismology, wireless communications, radio astronomy, acoustics, and biomedicine. Adaptive beam forming is used to detect and estimate the signal-of-interest at the output of a sensor array by means of optimal spatial filtering and interference rejection. Beam forming is a signal processing technique used in sensor arrays for directional signal transmission or reception. This is achieved by combining elements in the array in such a way that signals at particular angles experience constructive interference while others experience destructive interference. Beam forming can be used at both the transmitting and receiving ends in order to achieve spatial selectivity.

Beam forming techniques are mainly used to change the directionality of the array. When transmitting, a beam former controls the phase and relative amplitude of the signal at each transmitter, in order to create a pattern of constructive and destructive interference in the wave front.

Beam forming techniques can be broadly divided into two categories. They are manly divided based on the how the beam is forming.

- Conventional (fixed or switched beam) beam formers
- Adaptive beam formers or phased array

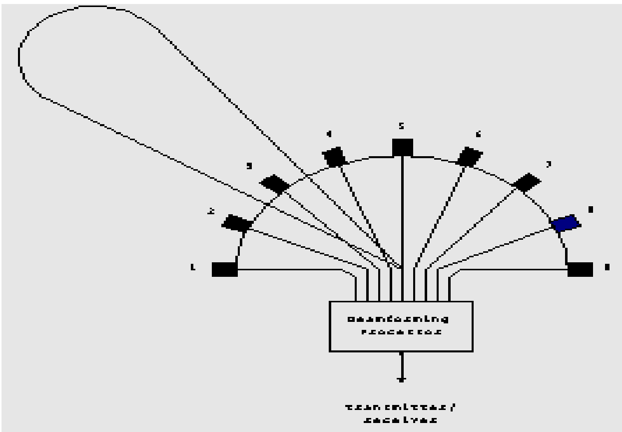

Fig.3 Beam Forming

Conventional beam formers use a fixed set of weightings and time-delays (or phasing's) to combine the signals from the sensors in the array, primarily using only information about the location of the sensors in space and the wave directions of interest. In contrast, adaptive beam forming techniques generally combine this information with properties of the signals actually received by the array, typically to improve rejection of unwanted signals from other directions. This process may be carried out in either the time or the frequency domain.

All the weights of the antenna elements can have equal magnitudes. The beam former is steered to a specified direction only by selecting appropriate phases for each antenna. If the noise is uncorrelated and there are no directional interferences, the signal-to-noise ratio of a beam former is given by

$$SNR = \frac{1}{\sigma_N^2}.P$$

Where P = Transmitting power, σ_N^2 = Noise Power

C. Global Positioning System

The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS satellites. It is maintained by the United States government and is freely accessible to anyone with a GPS receiver. The GPS program provides critical capabilities to military, civil and commercial users around the world. In addition, GPS is the backbone for modernizing the global air traffic system.

A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites high above the Earth. Each satellite continually transmits messages that include

- The Time The Message Was Transmitted
- Satellite Position At Time Of Message Transmission

The receiver uses the messages it receives to determine the transit time of each message and computes the distance to each satellite using the speed of light. Each of these distances and satellites' locations define a sphere. The receiver is on the surface of each of these spheres when the distances and the satellites' locations are correct. These distances and satellites' locations are used to compute the location of the receiver using the navigation equations.

This location is then displayed, perhaps with a moving map display or latitude and longitude; elevation information may be included. Many GPS units show derived information such as direction and speed, calculated from position changes.

In typical GPS operation, four or more satellites must be visible to obtain an accurate result. Four sphere surfaces typically do not intersect. Because of this we can say with confidence that when we solve the navigation equations to find an intersection, this solution gives us the position of the receiver along with accurate time thereby eliminating the need for a very large, expensive, and power hungry clock. The very accurately computed time is used only for display or not at all in many GPS applications, which use only the location. A number of applications for GPS do make use of this cheap and highly accurate timing. These include time transfer, traffic signal timing, and synchronization of cell phone base stations. Although four satellites are required for normal operation, fewer apply in special cases.

If one variable is already known, a receiver can determine its position using only three satellites. For example, a ship or aircraft may have known elevation. Some GPS receivers may use additional

clues or assumptions such as reusing the last known altitude, dead reckoning, inertial navigation, or including information from the vehicle computer, to give a (possibly Global Positioning System 7 degraded) position when fewer than four satellites are visible.

D. Space Division Multiple Access

SDMA (Space-Division Multiple Access or Spatial Division Multiple Access) is a MIMO (Multiple-Input and Multiple-Output, a multiple antenna schematic architecture)-based wireless communication network architecture, primarily suitable for mobile ad-hoc networks, which enables access to a communication channel by identifying the user location and establishing a one-to-one mapping between the network bandwidth division and the identified spatial location.

Space-Division Multiple Access (SDMA) is a channel access method based on creating parallel spatial pipes next to higher capacity pipes through spatial multiplexing and/or diversity, by which it is able to offer superior performance in radio multiple access communication systems.

E. Code Division Multiple Access

Code division multiple access (CDMA) is a channel access method used by various radio communication technologies. CDMA employs analog-to-digital conversion (ADC) in combination with spread spectrum technology. Audio input is first digitized into binary elements. The frequency of the transmitted signal is then made to vary according to a defined pattern (code), so it can be intercepted only by a receiver whose frequency response is programmed with the same code, so it follows exactly along with the transmitter frequency. There are trillions of possible frequency-sequencing codes, which enhance privacy and makes cloning difficult. One of the concepts in data communication is the idea of allowing several transmitters to send information simultaneously over a single communication channel.

This allows several users to share a band of frequencies. This concept is called multiple accesses. CDMA employs spread-spectrum technology and a special coding scheme (where each transmitter is assigned a code) to allow multiple users to be multiplexed over the same physical channel. By contrast, time division multiple access (TDMA) divides access by time, while frequency-division multiple access (FDMA) divides it by frequency. CDMA is a form of spread-spectrum signaling, since the modulated coded signal has a much higher data bandwidth than the data being communicated.

F. Various Types of Distributions

Poisson distribution: in probability theory and statistics, the Poisson distribution is a discrete probability distribution that expresses the probability of a given number of events occurring in a fixed interval of time and/or space if these events occur with a known average rate and independently of the time since the last event. The Poisson distribution can also be used for the number of events in other specified intervals such as distance, area or volume.

Gaussian distribution: In probability theory, the normal (or Gaussian) distribution is a continuous probability distribution, defined on the entire real line that has a bell-shaped probability density function, known as the Gaussian function. The normal distribution is considered the most prominent probability distribution in statistics. There are several reasons for this. First, the normal distribution arises from the central limit theorem, which states that under mild conditions, the mean of a large number of random variables independently drawn from the same distribution is distributed approximately normally, irrespective of the form of the original distribution. This gives it exceptionally wide application in, for example, sampling. Secondly, the normal distribution is very tractable analytically, that is, a large number of results involving this distribution can be derived in explicit form. For these reasons, the normal distribution is commonly encountered in practice, and is used throughout statistics, the natural sciences, and the social sciences as a simple model for complex phenomena.

Uniform Distribution: In probability theory and statistics, the discrete uniform distribution is a probability distribution whereby a finite number of equally spaced values are equally likely to be observed; every one of n values has equal probability 1/n.

Modules Name:

- Systems Characteristics And The Broadcasting Algorithm
- Probability Updating Scheme
- Performance Evaluation

VII. SYSTEMS CHARACTERISTICS AND THE 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 a 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 p_i of the demand probability d_i for each data item i among the set of the items the antenna broadcasts. For these reasons, the normal distribution is commonly encountered in practice, and is used throughout statistics, the natural sciences, and the social sciences as a simple model for complex phenomena.

$$\sum_{i=1}^{N} p_i = \sum_{i=1}^{N} d_i = 1 \tag{1}$$

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.

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

In this cost function, T is the current time, $R(i)$ the time when item i was last broadcast, l_i is the length of item i and $E(l_i)$ is the probability that an item of length l_i 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.

VIII. 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 for the operation $P(n)=\{p_1(n), p_2(n), ..., p_M(n)\}$ which represents the probability distribution represents the probability distribution for choosing one of the actions $a_1, a_2, ..., a_M$ at cycle.

$$\sum_{i=1}^{M} p_i(n) = 1 \qquad (3)$$

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 a_i 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 $p(n+1)$

$$p_{z,j(K+1)}=p_{z,j(k)}-L\left(1-\beta_z(k)\right)(p_{z,j}(k)-a), \forall j\neq i \qquad (4)$$

$$p_{z,j(K+1)}=p_{z,j}(k)+\ L\left(1-\beta_z(k)\right)\textstyle\sum_{j\neq i}\left(p_{z,j}(k)-a\right)\rightarrow 1 \qquad (5)$$

Where $p_{z,i}(k) \in (a, 1), \forall i \in [\![1..N]\!], L, a \in (0 \ldots 1)$,are 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.

IX. 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 SA 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 to count the no of clients in the location

X. 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. As compared to fixed antennas, smart antennas are providing uniform distribution among the group of clients.

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 Fig4

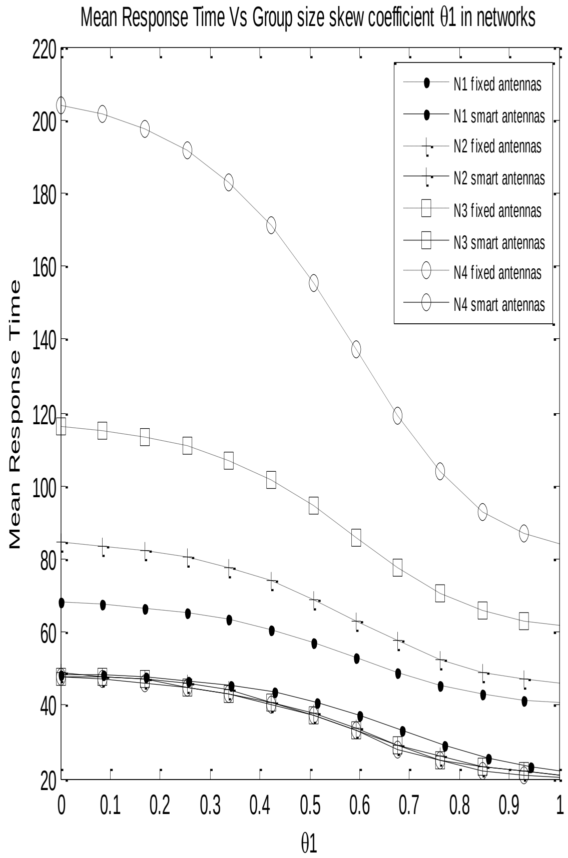

Fig. 4 Fixed Antennas Vs Smart Antennas

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 Fig 5

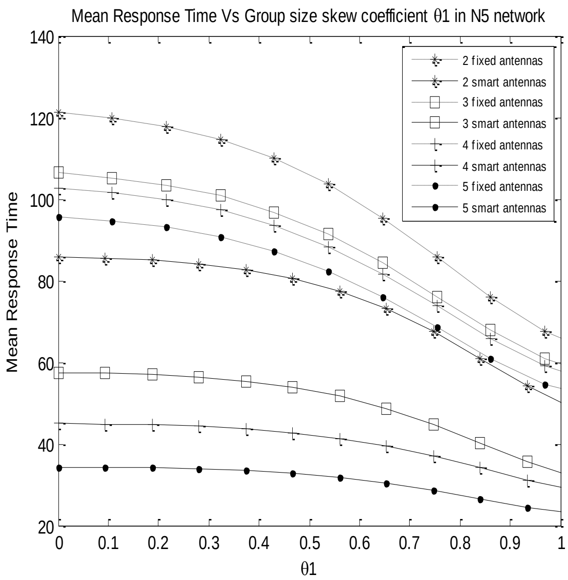

Fig.5. Fixed Antennas Vs Smart Antennas (Five Networks)

XI. FUTURE ENHANCEMET

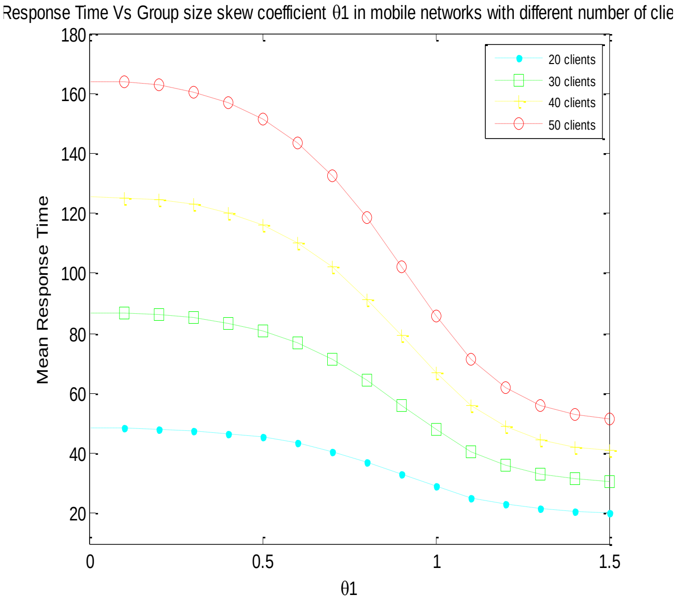

Fig5.Future enhancement of fixed antennas Vs smart antennas

XII. CONCLUSION

We proposed an smart antenna-based wireless push system by using learning automation tool where the beam width of each smart antenna is varied 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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