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On Performance Improvement of Wireless Push Systems Via 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 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, the proposed approach significantly increases the performance observed by the system clients.*

I. INTRODUCTION

1.1 GENERAL

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.

1.2 OBJECTIVES

The main goal of our 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.

1.3 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

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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.

1.4 EXISTING SYSTEM DISADVANTAGES

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

1.5 LITERATURE OF SURVEY

PUSH AND PULL BASED SYSTEMS :

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 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. The proposed CWDB procedure addresses the major omissions of preceding schemes, including the total lack of feedback mechanisms, extremely limited variety of spinning velocity definition algorithms, and no thorough and realistic testing of complete combinations of algorithms under various client configurations. A new efficient clustering-driven data grouping algorithm is also introduced.

Using learning automata for adaptive push-based data broadcasting in Asymmetric wireless environments:

Push systems are not suitable for applications with a priori unknown, dynamic client demands. This paper proposes an adaptive push-based system. It suggests the use of a learning automaton at the broadcast server to provide adaptivity 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.

1.6 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 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.

1.7 PROPOSED SYSTEM BLOCK DIAGARAM

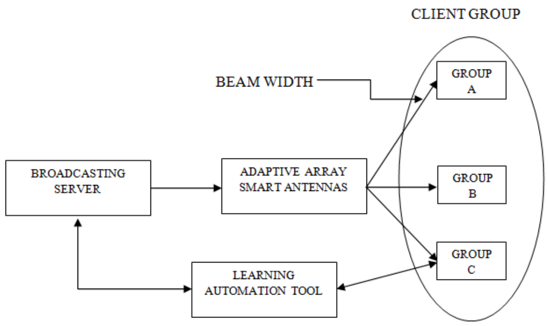

Fig.1 PROPOSED SYSTEM BLOCK DIAGARAM

1.8 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.

II. DESCRIPTION

2.1 GENERAL

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.

2.2 PROPOSED SYSTEM TECHNIQUES

2.2.1 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.

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.

2.2.2 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 beamformer 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.

Beamforming techniques can be broadly divided into two categories

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

Conventional beamformers 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 beamforming 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 beamformer 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 beamformer is given by

$$SNR = \frac{1}{\sigma_N^2}.P \quad \text{…………} \quad (1)$$

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

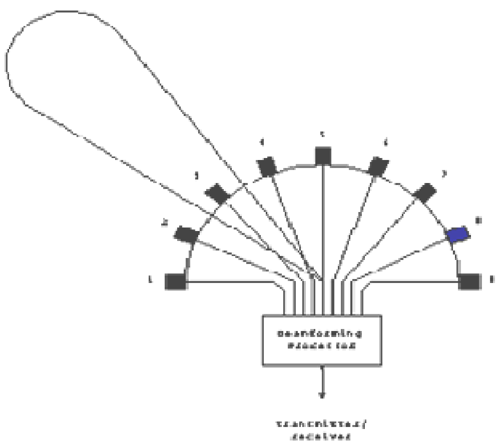

Fig.2 BEAM FORMING

2.2.4 INTERFERENCE

In communications and electronics, especially in telecommunications, interference is anything which alters, modifies, or disrupts a signal as it travels along a channel between a source and a receiver. The term typically refers to the addition of unwanted signals to a useful signal. Common examples are:

- Electromagnetic interference (EMI)
- Co-channel interference (CCI), also known as crosstalk
- Adjacent-channel interference (ACI)
- Intersymbol interference (ISI)
- Inter-carrier interference (ICI), caused by doppler shift in OFDM modulation (multi tone modulation).
- Common-mode interference (CMI)
- Conducted interference

Interference is typically but not always distinguished from noise, for example white thermal noise.

Radio resource management aims at reducing and controlling the co-channel and adjacent-channel interference.

2.2.5 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

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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.

2.2.5 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.

In traditional mobile cellular network systems, the base station has no information on the position of the mobile units within the cell and radiates the signal in all directions within the cell in order to provide radio coverage. These results in wasting power on transmissions when there are no mobile units to reach, in addition to causing interference for adjacent cells using the same frequency, so called co-channel cells. Likewise, in reception, the antenna receives signals coming from all directions including noise and interference signals. By using smart antenna technology and differing spatial locations of mobile units within the cell, space-division multiple access techniques offer attractive performance enhancements. The radiation pattern of the base station, both in transmission and reception is adapted to each user to obtain highest gain in the direction of that user. This is often done using phased array techniques.

2.2.4 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.

2.2.5 VARIOUS TYPES OF DISTRIBUTION TECHNIQUES

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.

2.3 MODULES NAME

1. Systems characteristics and the broadcasting algorithm
2. Probability updating scheme
3. Performance evaluation

2.4 MODULES EXPLANATION

2.4.1 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 beamwidth 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 p_i of the demand probability d_i 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.

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

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 (4).

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

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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),

$$N = \sum_{i=1}^{N} f_i l_i \quad \cdots\cdots\cdots \ (5)$$

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

$$S_i = \frac{N}{f_i} \quad \cdots\cdots\cdots \ (6)$$

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

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

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

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

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

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

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

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

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 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 $p(n+1)$.

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

……(11)

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

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.

2.4.3 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 in other similar research; Clients are grouped into G groups each one located at a different geographical region. Any client belonging to group g, $1 \leq g \leq G$, 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 λ.

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.

2.4.4 SYSTEM CHARACTERSTICS AND THE BROADCASTING ALGORITHM

We are already discussing about the entire system and how we are develop that system that are already presented in the previous reviews. We are hereby introducing some more interesting topics for our presentation. The topology of the proposed wireless push system, an example of which is shown in below, consists of a large number of clients and a BS equipped with a number of smart antennas. The fact that the system is of a push nature means that the system clients do not possess the ability to explicitly submit requests for data items, thus each client will wait for the item it demands to appear in the broadcast program constructed by the broadcast server.

In the proposed system, the ability of smart antennas to change their beam width is exploited so that the coverage area of each antenna is changed according to the current placement of clients within the system. This can be achieved by transmit beam forming, which allows a smart antenna to focus its transmit main beam towards the direction where the desired Client receivers reside and steer nulls in the other directions, so that clients residing in areas other than the desired one do not receive any transmission from this antenna. It has to be noted that such a requirement is nowadays easy to implement by already proposed smart antenna technology, which has gone even further by supporting Space Division Multiple Access (SDMA), a technique that requires from the smart antenna to form a transmission beam able to follow the movement of a specific mobile.

In this review we are mainly discussing about the various types of distributions and also discuss about the mobile users. In this paper we are mainly discussing about both fixed and mobile user. In previous reviews we are describing about the fixed user, so we move on to mobile users in this presentation.

2.4.5 SYSTEM PERFORMANCE INCREASING BY USING SMART ANTENNAS

The multiple directional antenna system does not fully exploit the potential of the available directional antennas at the BS. This is attributed to the fixed way that these serve the coverage area due to their lack of ability for beamwidth alteration. Therefore a significant room for improvement exists in cases where some of the antennas cover areas with a high density of groups (thus they serve the majority of clients) while the other antennas cover areas with few or no groups.

To this end, the proposed system is equipped with smart antennas instead of directional ones. Based on their capability of altering their beamwidth, the use of smart antennas aims at allocating a similar number of clients to each antenna and thus to achieve a more efficient coverage of the broadcast area in cases where the distribution of clients within the system area is not uniform. After that the information at the broadcasting server should be send as a control packet at each service location area. This aims to trigger t trigger the group of clients at this location area to send back a feedback. This should be done mainly based on the coordinates of the coverage area contained on the control packet and its local coordinates that are available via its GPS receiver, each client will determine whether it needs to respond to the control packet with a feed back. Specifically, each such control packet transmits the actual coordinate sets that define the boundaries of the selected service location area. Thus, the clients that respond to a control packet via a feedback are the ones residing inside the boundaries of the corresponding selected service area and these clients are classified as a group to the BS.

After the above procedure is completed for all service locations, the system will obtain an estimate of both the total number of clients of the system and number of clients within each service area of the system. By using the smart antenna we can also estimate the total number of clients present in for a particular antenna. By calculating this we can reduce the antenna overloading, by assigning the remaining clients to other smart antennas present in the system.

2.4.6 WIRELESS PUSH SYSTEM FOR MOBILE CLIENTS

In this literature we are also discussing about the mobile clients. The clients who are present in the broadcasting server should be a fixed or a mobile user. For the case of mobile user the users change their position for a particular time. So that we can find the corresponding position of the client so after that we have to transmit the signals. So for that we can find the location of the clients by using the below method. The control message to obtain the clients location needs to be sent by the BS for each service area at the beginning of the system operation. Then this procedure will be repeated in a periodic manner after a fixed number of item broadcasts so as to update the client location information at the BS and use this information for rearranging the antenna beam widths in case the distribution of clients within the coverage area of the system differs from the previously estimated one. The absolute frequency of this procedure depends on the moving rate of the clients, and can be set at a small value when clients move at small speeds. However as will be seen from the simulation results in the next Section, the performance of the smart-antenna based push system is still significantly improved compared to that of a multiple antenna system of fixed beamwidth antennas even in cases where there exist users that move at higher speeds than others. Using the procedure described above, apart from the efficient allocation of clients to the number of available antennas, each antenna is also set to exclude from its broadcast schedule the information items that refer to geographic areas that are out of its coverage. In this way no bandwidth is wasted to futile broadcasts, a fact that contributes to performance increase.

III. SOFTWARE SPECIFICATION

3.1 GENERAL MATLAB 7.14

Matlab (Matrix Laboratory) is a high-performance language for scientific and technological calculations. It integrates computation, visualization and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. It is a complete environment for high-level programming, as well as interactive data analysis. Some typical applications are

- system simulations,
- algorithm development,
- data acquisition, analysis, exploration, and visualization, as well as
- Modeling, simulation and prototyping.

Matlab was originally designed as a more convenient tool (than BASIC, FORTRAN or C/C++) for the manipulation of matrices. It was originally written to provide easy access to matrix software developed by the LINPACK and EISPACK projects. After- wards, it gradually became the language of general scientific calculations, visualization and program design. Today, Matlab engines incorporate the LAPACK and BLAS libraries, embedding the state of the art in software for matrix computations. It received more functionalities and it still remains a high-quality tool for scientific computation. Matlab excels at numerical computations, especially when dealing with vectors or matrices of data. It is a procedural language, combining an efficient programming structure with a bunch of predefined mathematical commands. While simple problems can be solved interactively with Matlab, its real power is its ability to create large program structures which can describe complex technical as well as non-technical systems. Mat- lab has evolved over a period of years with input from many users. In university environments, it is the standard computational tool for introductory and advanced courses in mathematics, engineering and science. In industry, Matlab is the tool of choice for highly-productive research, development and analysis.

This tutorial script summarizes the tasks and experiments done during the seminar Matlab for Communications offered by the Department of Communication Systems of the university Duisburg-Essen. This seminar gives the students the opportunity to get first in touch with Matlab and further to have background knowledge about the simulation of communication systems. After a detailed introduction describing the main usage as well as the different definitions in Matlab, some relevant selected topics, like amplitude modulation, fast Fourier transformation or convolution, are treated.

3.2 FEATURES OF MATLAB

MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. Typical uses include:

- Math and computation
- Algorithm development
- Modeling, simulation, and prototyping
- Data analysis, exploration, and visualization
- Scientific and engineering graphics
- Application development, including graphical user interface building

MATLAB is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix and vector formulations, in a fraction of the time it would take to write a program in a scalar non-interactive language such as C or FORTRAN. The name MATLAB stands for matrix laboratory.

MATLAB was originally written to provide easy access to matrix software developed by the LINPACK and EISPACK projects. Today, MATLAB uses software developed by the LAPACK and ARPACK projects, which together represent the state-of-the-art in software for matrix computation. MATLAB has evolved over a period of years with input from many users. In university environments, it is the standard instructional tool for introductory and advanced courses in mathematics, engineering, and science. In industry, MATLAB is the tool of choice for high-productivity research, development, and analysis. MATLAB features a family of application-specific solutions called toolboxes. Very important to most users of MATLAB, toolboxes allow you to learn and apply specialized technology. Toolboxes are comprehensive collections of MATLAB functions (M-files) that extend the MATLAB environment to solve particular classes of problems. Areas in which toolboxes are available include signal processing, control systems, neural networks, fuzzy logic, wavelets, simulation, and many others.

3.3 THE MATLAB SYSTEM

The MATLAB system consists of five main parts:

- **Development Environment**. This is the set of tools and facilities that help you use MATLAB functions and files. Many of these tools are graphical user interfaces. It includes the MATLAB desktop and Command Window, a command history, and browsers for viewing help, the workspace, files, and the search path.
- **The MATLAB Mathematical Function Library**. This is a vast collection of computational algorithms ranging from elementary functions like sum, sine, cosine, and complex arithmetic, to more sophisticated functions like matrix inverse, matrix eigenvalues, Bessel functions, and fast Fourier transforms.
- **The MATLAB Language**. This is a high-level matrix/array language with control flow statements, functions, data structures, input/output, and object-oriented programming features. It allows both "programming in the small" to rapidly create quick and dirty throw-away programs, and "programming in the large" to create complete large and complex application programs.
- **Handle Graphics**. This is the MATLAB graphics system. It includes high-level commands for two-dimensional and three-dimensional data visualization, image processing, animation, and presentation graphics. It also includes low-level commands that allow you to fully customize the appearance of graphics as well as to build complete graphical user interfaces on your MATLAB applications.
- **The MATLAB Application Program Interface (API).** This is a library that allows you to write C and FORTRAN programs that interact with MATLAB. It include facilities for calling routines from MATLAB (dynamic linking), calling MATLAB as a computational engine, and for reading and writing MAT-files.

3.4 DESKTOP TOOLS

This section provides an introduction to MATLAB's desktop tools. You can also use MATLAB functions to perform most of the features found in the desktop tools. The tools are:

- Current Directory Browser
- Workspace Browser
- Editor/Debugger
- Command Window
- Command History
- Help Browser

- **Command History** Lines you enter in the Command Window are logged in the Command History window. In the Command History, you can view previously used functions, and copy and execute selected lines. To save the input and output from a MATLAB session to a file, use the diary function.
- **Command Window**

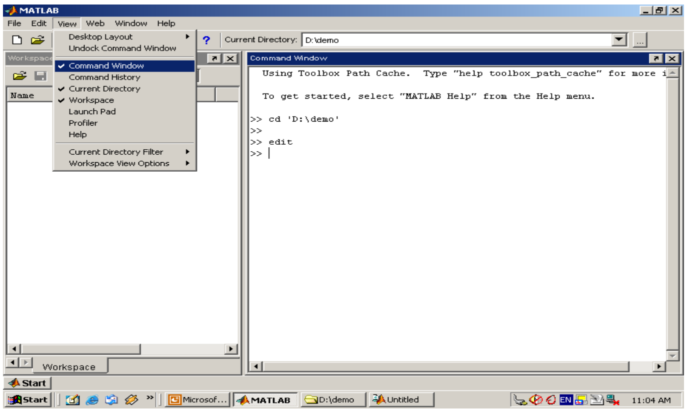

Fig.3 COMMAND WINDOW

- **Running External Programs** You can run external programs from the MATLAB Command Window. The exclamation point character! is a shell escape and indicates that the rest of the input line is a command to the operating system. This is useful for invoking utilities or running other programs without quitting MATLAB. On Linux, for example,!emacs magik.m invokes an editor called emacs for a file named magik.m. When you quit the external program, the operating system returns control to MATLAB.
- **Launch Pad** MATLAB's Launch Pad provides easy access to tools, demos, and documentation.
- **Help Browser** Use the Help browser to search and view documentation for all your Math Works products. The Help browser is a Web browser integrated into the MATLAB desktop that displays HTML documents.

To open the Help browser, click the help button in the toolbar, or type help browser in the Command Window. The Help browser consists of two panes, the Help Navigator, which you use to find information, and the display pane, where you view the information.

- **Help Navigator:** Use to Help Navigator to find information. It includes:
- **Product filter:** Set the filter to show documentation only for the products you specify.
- **Contents tab :** View the titles and tables of contents of documentation for your products.
- **Index tab** :Find specific index entries (selected keywords) in the Math Works documentation for your products.
- **Search tab:** Look for a specific phrase in the documentation. To get help for a specific function, set the Search type to Function Name.
- **Favorites tab :**View a list of documents you previously designated as favorites.
- **Print pages** :Click the print button in the toolbar.
- **Display Pane :**After finding documentation using the Help Navigator, view it in the display pane. While viewing the documentation, you can:
- **Browse to other pages** : Use the arrows at the tops and bottoms of the pages, or use the back and forward buttons in the toolbar.
- **Bookmark pages** : Click the Add to Favorites button in the toolbar.
- **Find a term in the page** Type a term in the Find in page field in the toolbar and click Go.
- **Current Directory Browser**

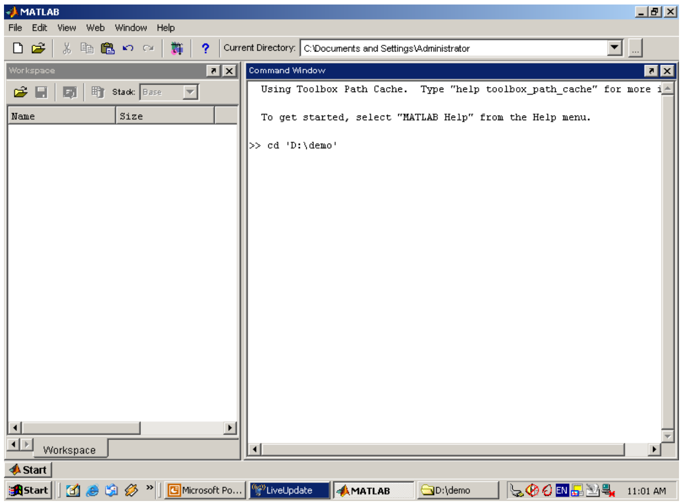

Fig.4 CURRENT DIRECTORY BROWSER

MATLAB file operations use the current directory and the search path as reference points. Any file you want to run must either be in the current directory or on the search path.

- **Search Path :**To determine how to execute functions you call, MATLAB uses a search path to find M-files and other MATLAB-related files, which are organized in directories on your file system. Any file you want to run in MATLAB must reside in the current directory or in a directory that is on the search path. By default, the files supplied with MATLAB and Math Works toolboxes are included in the search path.
- **Workspace Browser :** The MATLAB workspace consists of the set of variables (named arrays) built up during a MATLAB session and stored in

memory. You add variables to the workspace by using functions, running M-files, and loading saved workspaces. To delete variables from the workspace, select the variable and select Delete from the Edit menu. Alternatively, use the clear function. The workspace is not maintained after you end the MATLAB session. To save the workspace to a file that can be read during a later MATLAB session, select Save Workspace As from the File menu, or use the save function. This saves the workspace to a binary file called a MAT-file, which has a .mat extension. There are options for saving to different formats. To read in a MAT-file, select Import Data from the File menu, or use the load function.

- **Array Editor:** Double-click on a variable in the Workspace browser to see it in the Array Editor. Use the Array Editor to view and edit a visual representation of one- or two-dimensional numeric arrays, strings, and cell arrays of strings that are in the workspace. If you just need to view the contents of an M-file, you can display it in the Command Window by using the type function.
- **Editor/Debugger:** Use the Editor/Debugger to create and debug M-files, which are programs you write to run MATLAB functions. The Editor/Debugger provides a graphical user interface for basic text editing, as well as for M-file debugging. You can use any text editor to create M-files, such as Emacs, and can use preferences (accessible from the desktop File menu) to specify that editor as the default. If you use another editor, you can still use the MATLAB Editor/Debugger for debugging, or you can use debugging functions, such as dbstop, which sets a breakpoint. If you just need to view the contents of an M-file, you can display it in the Command Window by using the type function. MATLAB supports the entire data analysis process, from acquiring data from external devices and databases, through preprocessing, visualization, and numerical analysis, to producing presentation-quality output.

3.5 DATA ANALYSIS MATLAB is an efficient platform for accessing data from files, other applications, databases, and external devices. You can read data from popular file formats, such as Microsoft Excel; ASCII text or binary files; image, sound, and video files; and scientific files, such as HDF and HDF5. Low-level binary file I/O functions let you work with data files in any format. Additional functions let you read data from Web pages and XML.

MATLAB provides interactive tools and command-line functions for data analysis operations, including:

- Expressions
- Visualizing Data
- Handling matrices
- Curve fitting
- Matrix analysis
- Analyzing and accessing data

Like most other programming languages, Matlab provides mathematical expressions, but unlike most programming languages, these expressions involve entire matrices. The building blocks of expressions are

- Variables
- Numbers
- Operators
- Functions

3.5.1 Variables

Matlab does not require any type declarations or dimension statements. When a new variable name is introduced, it automatically creates the variable and allocates the appropriate amount of memory. If the variable already exists, Matlab changes its contents and, if necessary, allocates new storage.

For example

```
>> books = 10
```

Creates a 1-by-1 matrix named books and stores the value 10 in its single element. In the expression above, >> constitutes the Matlab prompt, where the commands can be entered.

Variable names consist of a string, which start with a letter, followed by any number of letters, digits, or underscores. Matlab is case sensitive; it distinguishes between uppercase and lowercase letters. A and a are not the same variable. To view the matrix assigned to any variable, simply enter the variable name.

3.5.2 Numbers

Matlab uses the conventional decimal notation. A decimal point and a leading plus or minus sign is optional. Scientific notation uses the letter e to specify a power-of-ten scale factor. Imaginary numbers use either i or j as a suffix. Some examples of legal numbers are:

7 -55 0.0041 9.657838 6.10220e-10 7.03352e21 2i -2.71828j 2e3i 2.5+1.7j.

3.5.3 Operators

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Expressions use familiar arithmetic operators and precedence rules. Some examples are:

+ Addition
- Subtraction
* Multiplication
/ Division
’ Complex conjugate transpose

3.5.4 Functions

Matlab provides a large number of standard elementary mathematical functions, including sin, sqrt, exp, and abs. Taking the square root or logarithm of a negative number does not lead to an error; the appropriate complex result is produced automatically. Matlab also provides a lot of advanced mathematical functions, including Bessel and Gamma functions. Most of these functions accept complex arguments. For a list of the elementary mathematical functions, type

>> help elfun

Some of the functions, like sqrt and sin are built-in. They are a fixed part of the Matlab core so they are very efficient. The drawback is that the computational details are not readily accessible. Other functions, like gamma and sinh, are implemented in so called M-files. You can see the code and even modify it if you want.

3.6 VISUALIZING DATA

All the graphics features that are required to visualize engineering and scientific data are available in MATLAB. These include 2-D and 3-D plotting functions, 3-D volume visualization functions, tools for interactively creating plots, and the ability to export results to all popular graphics formats. You can customize plots by adding multiple axes; changing line colors and markers; adding annotation, Latex equations, and legends; and drawing shapes.

3.6.1 2-D Plotting

Visualizing vectors of data with 2-D plotting functions that create:

- Line, area, bar, and pie charts.
- Direction and velocity plots.
- Histograms.
- Polygons and surfaces.
- Scatter/bubble plots.
- Animations.

3.6.2 3-D Plotting and Volume Visualization

MATLAB provides functions for visualizing 2-D matrices, 3-D scalar, and 3-D vector data. You can use these functions to visualize and understand large, often complex, multidimensional data. Specifying plot characteristics, such as camera viewing angle, perspective, lighting effect, light source locations, and transparency.

3-D plotting functions include:

- Surface, contour, and mesh.
- Image plots.
- Cone, slice, stream, and iso-surface.

IV. FUTURE ENHANCEMENT

In this literature 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.

V. 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.

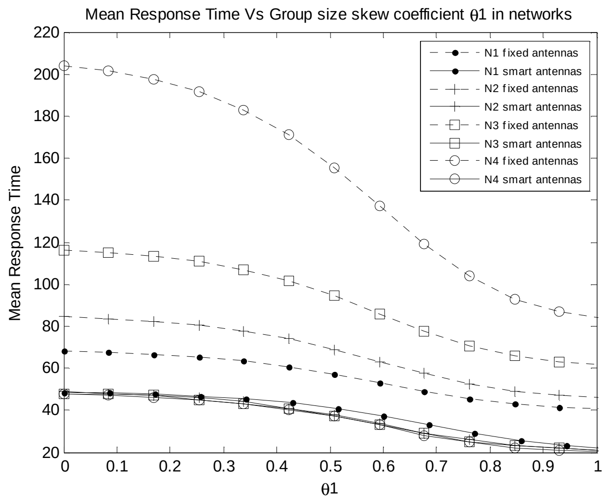

Fig. 8 FIXED ANTENNAS VS SMART ANTENNAS

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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.9

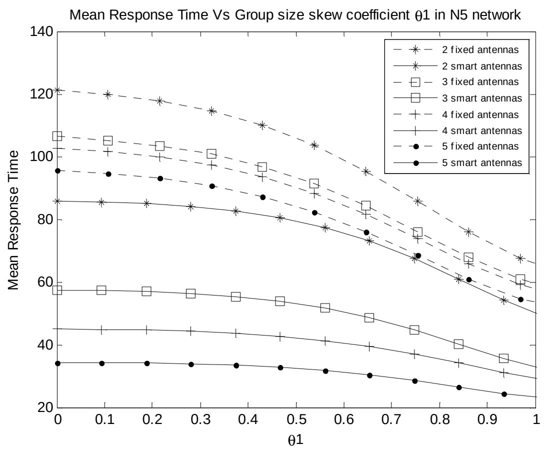


Fig.9 FIXED ANTENNAS VS SMART ANTENNAS (FIVE NETWORKS)

In fig.10 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.

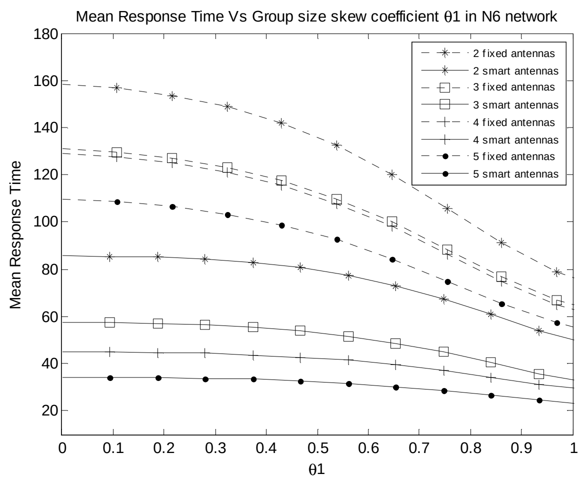
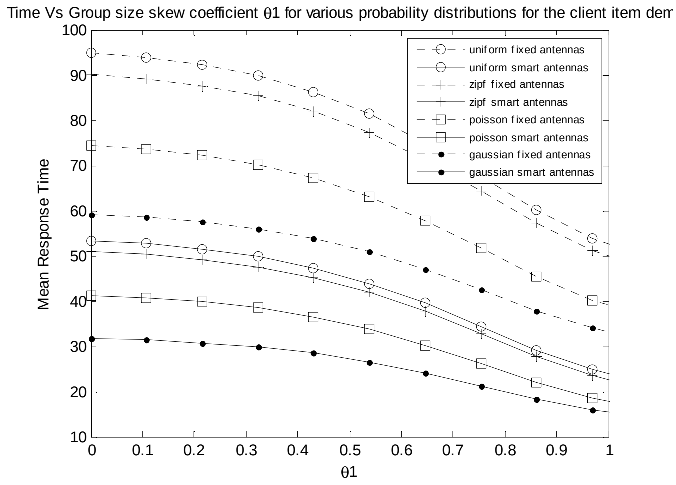
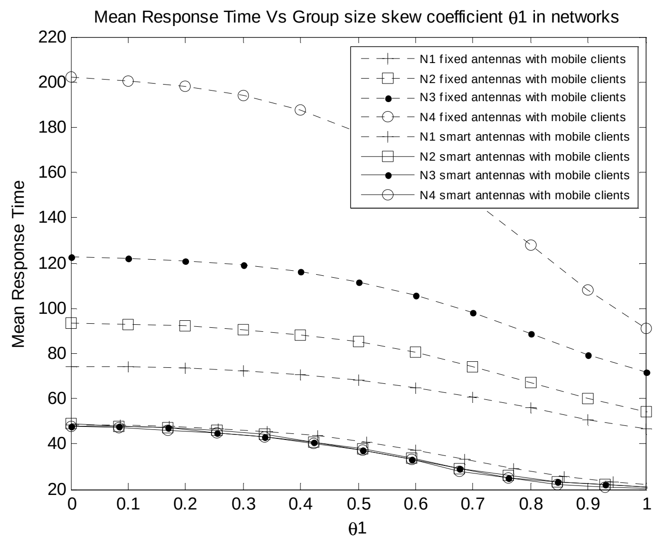


Fig.10 FIXED ANTENNAS VS SMART ANTENNAS (SIX NETWORKS)

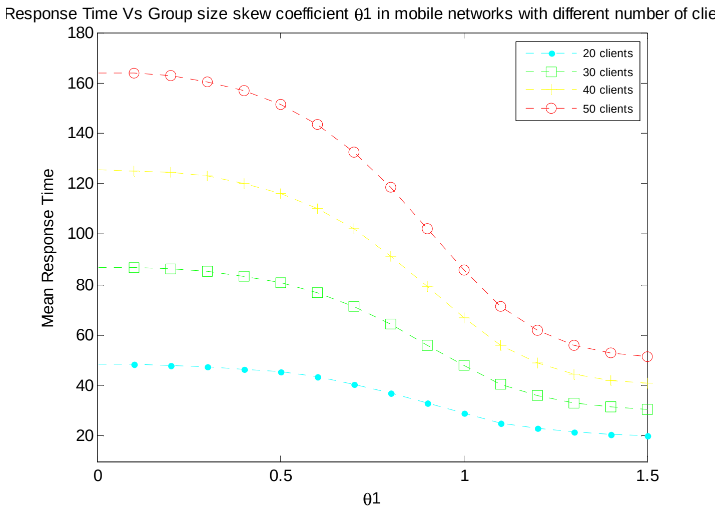
In fig.11 we are check the performance for various types of distributions. We use three different types of distribution techniques; they are uniform distribution, Poisson distribution, Gaussian distribution and Zipf distribution. And make this calculation we can check the performance of the entire system.



In fig.12 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.



VI. FUTURE ENHANCEMET



VII. CONCLUSION

This letter proposed an adaptive smart antenna-based wireless push system where the beamwidth of each smart 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.

REFERENCES

[1] C. Liaskos, S. Petridou, and G. Papadimitriou, “Towards realizable, low cost broadcast systems for dynamic environments,” *IEEE Trans. Netw.*, vol. 19, no. 2, pp. 383–392, Apr. 2011.

[2] P. Nicopolitidis, G. I. Papadimitiou, and A. S. Pomportsis, “Adaptive data broadcasting in underwater wireless networks,” *IEEE J. Oceanic Eng.*, vol. 35, no. 3, pp. 623–634, July 2010.

[3] C. Liaskos, S. Petridou, G. I. Papadimitriou, P. Nicopolitidis and A. S. Pomportsis, “On the analytical performance optimization of wireless data broadcasting,” *IEEE Trans. Veh. Technol.*, vol. 59, no. 2, pp. 884– 895, Feb. 2010.

[4] P. Nicopolitidis, G. I. Papadimitiou, and A. S. Pomportsis, “Continuous flow wireless data broadcasting for high-speed environments,” *IEEE Trans. Broadcast.*, vol. 55, no. 2, pp. 260–269, June 2009.

[5] C. Liaskos, S. Petridou, G. I. Papadimitriou, P. Nicopolitidis, M S. Obaidat, and A. S. Pomportsis, “Clustering-driven wireless data broadcasting,” *IEEE Wireless Commun. Mag.*, vol. 16, no. 6, pp. 80–87, Dec. 2009.

[6] P. Nicopolitidis, G. I. Papadimitriou, and A. S. Pompotsis, “Using learning automata for adaptive push-based data broadcasting in asymmetric wireless environments,” *IEEE Trans. Veh. Technol.*, vol. 51, no. 6, pp. 1652–1660, Nov. 2002.

[7] A. B. Waluyo, W. Rahayu, D. Taniar, and B. Scrinivasan, “A novel structure and access mechanism for mobile data broadcast in digital ecosystems,” *IEEE Trans. Industrial Electron.*, vol. 58, no. 6, pp. 2173– 2182, June 2011.

[8] Y. De-Nian and C. Ming-Syan, “Data broadcast with adaptive network coding in heterogeneous wireless networks,” *IEEE Trans. Mobile Comput.*, vol. 8, no. 1, pp. 109–125, Jan. 2009.

[9] I. Stojanovic, W. Zeyu, M. Sharif, and D. Starobinski, “Data dissemination in wireless broadcast channels: network coding versus cooperation,” *IEEE Trans. Wireless Commun.*, vol. 8, no. 4, pp. 1726–1732, Apr. 2009.

[10] P. Nicopolitidis, G. I. Papadimitriou, and A. S. Pompotsis, “Multipleantenna data broadcasting for environments with locality of demand,” *IEEE Trans. Veh. Technol.*, vol. 56, no. 5, pp. 2807–2816, Sep. 2007.

[11] P. Nicopolitidis, G. I. Papadimitriou, and A. S. Pomportsis, “Exploiting locality of demand to improve the performance of wireless data broadcasting,” *IEEE Trans. Veh. Technol.*, vol. 55, no. 4, pp. 1347–1361, July 2006.

[12] V. L. Kakali, G. I. Papadimitriou, P. Nicopolitidis, and A. S. Pomportsis, “A new class of wireless push systems,” *IEEE Trans. Veh. Technol.*, vol. 58, no. 8, pp. 4529–4539, Oct. 2009.

[13] P. H. Lehne and M. Pettersen, “An overview of smart antenna technology for mobile communication systems,” *IEEE Commun. Surveys &Tutorials*, Fourth Quarter 1999, vol. 2, no. 4.

[14] C. A. Balanis and P. I. Ioannides, *Introduction to Smart Antennas*. Morgan & Claypool Publishers, 2007.

[15] M. A. L. Thathachar and P. S. Sastry, *Networks of Learning Automata,Techniques for Online Stochastic Optimization*. Kluwer Academic Publishers, 2004.

[16] K. S. Narendra and M. A. L. Thathachar, *Learning Automata: An Introduction*. Prentice-Hall, 1989.

[17] P. Nicopolitidis, G. I. Papadimitiou, P. G. Sarigiannidis, M. S. Obaidat, and A. S. Pomportsis, "Adaptive wireless networks using learning automata," *IEEE Wireless Commun. Mag.*, vol. 18, no. 2, pp. 75–81, Apr. 2011.

[18] G. I. Papadimitriou, "Hierarchical discretized pursuit nonlinear learning automata with rapid convergence and high accuracy," *IEEE Trans. Knowledge Data Eng.*, vol. 6, no. 4, pp. 654–659, Aug. 1994.

[19] A. Torkestani and M. Meybodi, "An efficient cluster-based CDMA/TDMA scheme for wireless mobile ad-hoc networks: a learning automata approach," *J. Netw. Comput. Appl.*, vol. 33, no. 4, pp. 477–490, July 2010.