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# CLIENT DENSITY BASED INTELLIGENT DESIGN OF MICROSTRIP PATCH ANTENNA FOR MOBILE HANDSETS

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## ABSTRACT

*A multiband broadcasting that can be used for mobile handsets is presented. This antenna consists of a smart micro strip patch antenna, passive antenna data broadcasting and a low noise amplifier. The design procedure of this antenna, in which the passive antenna shows very different impedances at each band, is also presented. It is proposed configuration can be used as a multiband receiving patch antenna for multiple band. In environments with locality of client demands, the use of multiple directional antennas at the Broadcasting has been shown to increase performance. In many cases 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 mobile. This letter proposes smart patch antenna based wireless push system where the beam width of each micro strip patch antenna is altered based on the current placement of clients within the network. Coupled with a modification of the broadcast schedule, the proposed approach significantly increases the performance.*

*Keywords: micro strip patch antenna, broadcast schedule, directional antennas, smart patch antenna*

## I INTRODUCTION

The trends in broadcasting systems can be summarized as the move from analog to digital and from static. In environments with locality of client demands, the use of multiple directional antennas at the Broadcast Server splits the client population to groups of clients that exhibit higher demand skewness and has been shown to increase performance. It has generated great interest in multiband antennas, and antennas that can cover VHF and UHF ands have been reported. In such a system, each antenna is equipped with a Learning Automaton (LA) whose probability distribution vector determines the popularity of each information item among the clients in the service area of the antenna. However, depending on the actual placement of clients within the coverage area of the system, there can exist cases where the use of directional antennas of fixed beam width limits the amount of performance improvement over single antenna systems. This is because the coverage area of each such antenna is fixed and does not follow the geographical distribution of clients within the coverage area of the system. This letter

presents a new receiving smart micro strip patch antenna for VHF/UHF/L/multiband this new antenna differs from the mono band antennas presented. The proposed multiband smart patch antenna consists of a Databroadcasting, multiband antenna and smart micro strip patch antennas. In order to be used for mobile handsets, the size of the patch antenna should be small. However, small sizing cause large imaginary impedance and small antenna radiation resistance, and these factors degrade antenna gain. Therefore, the multiband LNA should cancel the imaginary impedance of the antenna and should have a positive gain. Then, the output impedance of the multiband LNA, which is the output impedance of the patch antenna, should be well matched with the impedance of saw filter or receiver circuits at each band.

Fig: 1. Example of the proposed systems topology

## II. METHODOLOGY

### II.1 THE SMART PATCH ANTENNA ADAPTIVE WWIRELESS SYSTEM

#### A. Systems Characteristics

The topology of the proposed wireless push system, an example of which is shown in Figure 1, consists of a large number of clients and a BS equipped with a number of smart patch antennas. The fact that the system is of a push nature means that the mobile network 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, a technique that requires from the smart micro strip patch antenna to form a transmission beam able to follow the movement of a specific mobile. The proposed system can thus work with any kind of smart antennas that offer the property of alterable beam width, thus with both switched beam smart antennas and adaptive array ones. In the proposed system, each smart microstrip patch antenna is equipped with a Learning Automaton for the estimation of the demand probability of the information items that are broadcast to the clients under its coverage. A LA is an automaton that improves its performance by interacting with the random environment in which it operates. LA have been applied to several problems in the area of wireless networks including wireless data broadcasting adaptive mobile ad-hoc networks the design of self-adaptive MAC protocols etc. The client population

exhibits locality of demand. This means that clients are grouped into groups each one located at a different place with members of each group having similar demands, different from those of clients at other groups. The clients are considered equipped with GPS receivers, a requirement that is common nowadays. Each network of the item it is waiting for via Code Division Multiple Access.

B. Using smart micro strip patch antennas for performance increase

The multiple directional antenna system of 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 beam width alteration. Therefore a significant room for improvement exists in cases where some of the antennas cover areas with a high density of groups while the other antennas cover areas with few or no groups. To this end, the proposed system is equipped with smart patch antennas instead of directional ones. Based on their capability of altering their beam width, the use of smart patch 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. 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 feedback. The total number of clients is divided to the number of the smart antennas, so that an estimation of the number of clients that will be assigned to each antenna is obtained. The number of client groups that are assigned to the first antenna will be such that the population of the antenna is at least equal to the above estimated number of clients per antenna. If the last group that has been assigned to the antenna overloads the antenna, it will be unassigned from the specific antenna in order to be assigned later to the next one. An example of the above procedure is depicted in Figure 1. Assume that the BS employs three smart patch antennas and client population comprises groups A, B, *C*, D, E, and F consisting of 100, 150, 150, 100, 300 and 200 clients respectively. As shown in the Figure, the above described scheme alters the beam width of the three antennas and assigns groups to antennas in such a way that numbers of assigned clients per antenna is close to each other. If we were to serve the clients in the system via a system of three fixed-beam width directional antennas, the fact that the client distribution is time-variable and a-priori unknown would lead to the use of three antennas of 120 degrees beam width each so as to cover the entire area around the BS. It can be easily seen that in the scenario Shown in figure. One of those fixed-beam width antennas would cover an area having no clients and would thus remain unexploited. Moreover, the number of clients covered by each of the other two antennas would totally depend on the client distribution within the coverage area and would probably not be close to each other as would be the case of the example smart antenna system described above. 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 beam width 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. RELATED WORK

To make trends in broadcasting systems can be summarized as the move from analog to digital and from static to mobile. Therefore, digital multimedia broadcasting standard uses a different multiband band. However, these are insufficient for use in mobile handsets due to their large volumes. Since the antenna • fs physical size is dependent on the multi frequency bands of interest, it is very difficult to reduce the size of passive antennas. To miniaturize antennas, researchers have begun to consider micro strip patch antennas as good candidates. This work has support advanced mobile devices and equipments led by the Chung cheong Leading Industry Office of the Korean Ministry of Knowledge Economy.

## IV. CONCLUSION

In this paper, we propose a smart micro strip patch antenna based wireless push system where the beam width of each micro strip patch 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 and boosts the low gain of the antenna in the multiband. The smart micro strip patch antenna concept to implement the multiband antenna reduces the antenna size greatly and makes the frequency characteristics not dependent on the physical dimensions.

## V. FUTURE SCOPE

In future this work can be extended for high speed users who move from one geographical area to another area with in very short time. The number of Micro strip patch Antenna can be extended to 4,5,6, • c9 which orients at an azimuth angle of 90 , 72 , 60 , • c.40 degrees respectively . If each group size is g and the total no. of groups is G and the number of users

assigned in each group is N, where N is time varying, then N . g . G. As N increases then g increases but G remains constant. As G increases then no of Smart antennas used increases, so beam width of the Antenna is varied in a wider range leading to better performance. A 5 antenna system has a performance improvement of 4.2dB when compared with 3 antenna system and 9 antenna systems has a performance improvement of 9.1 dB when compared to 3 antenna system and making the mobile users to have good performance.

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