

Performance Analysis in Smart Antenna for Ad-Hoc Networking: A Review

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Abstract: No matter what quantity we tend to state the glory of wireless communications we simply cannot agree that these sorts of communications can deliver a far higher potency as well as high data rate. This Paper explores all the attributes which tends be one of those efforts. Many necessary aspects of this advanced system were mentioned during this paper like sorts and criteria of smart antenna more explain the arrival of the system. In this paper we will examine Smart antenna Performance on MAC layer and Beam forming. This paper provides a legitimate plan regarding smart antenna and it is capable of causing interest of further research about the respective matter.

Keywords: Omni-directional, Sectorized, Diversity, Smart Antenna.

I. INTRODUCTION

The word **Ad Hoc** usually specifies a solution which has been made on the fly for particular objective. Ad-hoc network does not need any router. It does not need any wireless Base station. This network is established for single session only. Ad-hoc network is not a permanent network connection. It is created to solve specific problem. If we are going to establish such network for longer period then it is a local area network. Wireless network are gaining popularity from 1970. From several decades there are a lot of researches made on Ad-hoc networking. Ad-Hoc networks is playing significant role in case of military application & several researches such as global mobile information system program. It is also useful in case of program related to near term digital radio. There are new spaces of commercial & industrial application for network that are wireless Ad-Hoc based. Ad-Hoc networks allow information to route from different path after old routes are destroyed. Due to Ad-Hoc network new kind of algorithms to route information has been developed.

In a wireless network, previously an omni-directional antenna had been used at base stations for coverage area. It radiates and receives energy in all direction. Because of this it leads to wastage of power and co-channel interference.

As per the drawback, omni-directional needs improvement in capacity and channel interference which leads to growth of types of antennas: Sectorized, Diversity and Smart antenna.

A **sectorized antenna** in this a base station divides a cellular system into a sectors or sub cells. By means of sectors it increases reuse of channel and reduce interference of channel.

A **diversity antenna** uses multiple antenna elements at base station and they are separated by some physical separation (at least). It improves reception by minimize multipath fading.

Two methods of diversity scheme:

Switched diversity: in this, one antenna is at different physical separated position and switch time to time to use the elements with largest output. It improves signal fading but doesn't increase gain because one antenna work at a time.

Diversity combining: it uses combining concept multipath signal are received by different antenna are combined and their phase error are corrected so as to increase gain and improved multipath fading problem. But it uses one element at a time which does not lead to uplink gain. To improve this problem new evolution is made in antenna that's smart antenna.

II. SMART ANTENNA

Smart antenna is comprised of no. of individual antennas and associated signal processors which give the "smart" part. Smart antenna will use each for the signal transmission and signal reception. It automatically changes direction of radiation patterns in wireless network. The key advantage to employ a smart antenna is to decrease the whole system

power, drop in communication interference, and rise in system capability or improve in system power effectiveness. Smart antenna at the receivers offers the reduction of signal lose in multipath weakening, which suggest additional overall strong signal quality independent of variation of transmitted signal.

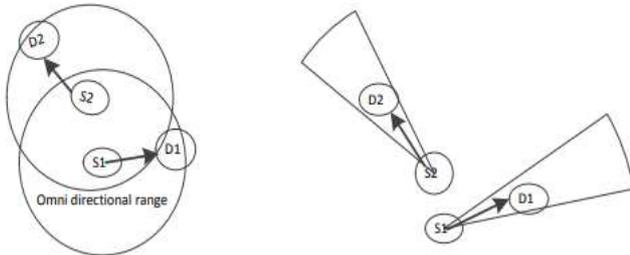


Figure 1. Capacity of a network with omni directional antennas and a network with smart antennas.

A. Functions of smart antenna:

1. Direction of Arrival Estimation (DOA):

In smart antennas to find the DOA of a signal various techniques like MUSIC (Multiple Signal Classification) algorithms are used. A lot of computations and algorithms are required in this method. The antenna acts like a sensor in which the DOA is found out from the peaks of this spectrum and a spatial spectrum of the array is selected.

2. Beam forming:

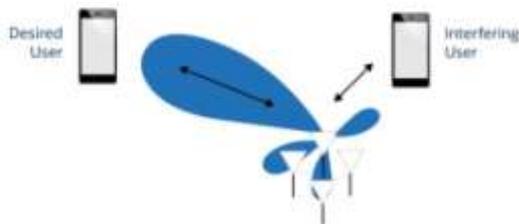


Figure 2. Beam Forming.

Beam forming is an algorithm which keeps records of some parameters like node location, speed and distance for improving signal. Its main function is to form a beam at receiver and if a beam is located at wrong receiver than its phase collide or destroy.

B. Types of Smart Antenna:

There is two type of smart antenna mainly:

1. Switched Beam:

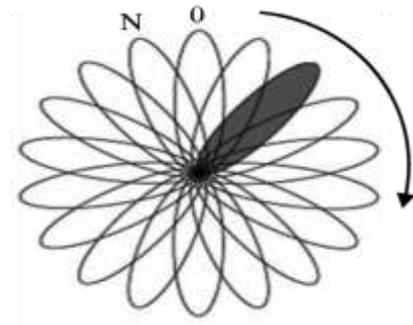


Figure 3. Switched Beam.

Switched beam in this many beams are permanently defined in fixed size and selected for user as suitable. As shown in Fig. a switched beam have an N beams with width $2\pi/N$ radians as per beam.

2. Adaptive Array antennas:

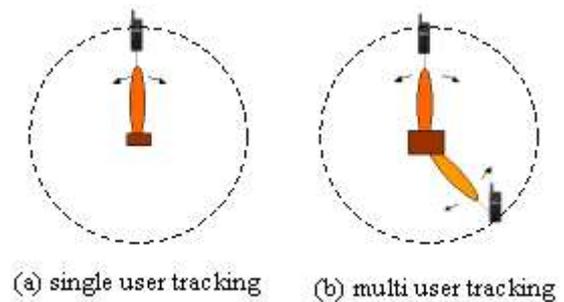


Figure 4. Adaptive Array antenna.

In Adaptive antenna arrays a lobe is made at user and put null at interference. A beam is guided if any user wants to contact with its neighbor for giving main lobe to its neighbor.

III. LITERATURE REVIEW

C. “Smart Antenna System Analysis, Integration and Performance for Mobile Ad-Hoc Networks (MANETs)”:

This paper focuses on interface as well as combination of many important parts of a MANET by means of smart antenna systems. The main goal is to design a smart antenna for MANET devices operating at 20 GHz. A channel access protocol is used for analyzing network throughput. This paper also examines a issues which comes by use of DOA algorithm and outcome of adaptive algorithm. Besides, a study describes methods and algorithms to conflict the consequences of weakening channels on system.

D. “Advances in smart antenna system”:

This paper shows transient description on smart antenna (SA) system. A smart or adaptive antenna arrays incorporates a collection of antenna fundamentals by signal process ability that optimizes the emission and response of a preferred signal energetically. SA can set zero within the path of interferers by adaptive change of weights connected to every antenna part. SAs therefore get rid of nearly all of the co-channel interference leading to higher value of reception and lesser drop calls. SAs also follow the user among a cell through direction of arrival algorithms.

E. “Genetic Algorithm based Smart Antenna design for UWB Beam forming”:

This paper tends to propose a smart antenna for Impulse-based UWB beam forming and investigate its performance. An approach is presented to minimize UWB interference comes from supplementary rather depend on direction of antenna. On each branch of array a tapped delay line is utilized for dealing UWB signal. Also, with the help of genetic algorithm a weight is adjusted of antenna array output while controlling preferred frequency response in desired direction.

F. “On the Direction of Arrival (DoA) Estimation for a Switched-Beam Antenna System Using Neural Networks”:

In this article firstly, style and study of simple DOA estimation procedure is done that will help in beam forming for wireless network. Within paper an author introduce a NN-DoA estimation method for a SBS and its extension to a DS-CDMA scheme. Further, a method is improved for radiation pattern and comparison with MUSIC algorithm is also shown.

G. “Use of Smart Antennas in AD-HOC network”:

The capability of ad hoc network existence strictly restricted because of interference constraint. A technique of mistreatment up the capability of ad hoc networks is with employment of smart antennas. SAs enable the energy to survive transmit or else receive in an exceedingly explicit way as against diffusive energy every single told directions. This help to achieve important abstraction reclaim and thus increasing capability of the network. Yet, employment of smart antennas on upper layer is very difficult. Above all, the medium access control and the routing layers can need

changes along with created response to the presence of such antennas so as to develop their use. This research article tend to inspect the assorted challenges so as to arise once such antennas inside ad hoc networks.

H. “A Survey on Smart Antenna System”:

Smart Antenna system is that one amongst the foremost speedily rising areas of communications. This is often the review of paper that shows standard and dealing of smart antennas also magnificence of their application in numerous fields such a 4G telecommunication system, top quality of multi carrier modulations like OFDMA etc. In this paper a adaptive RLS algorithm is used for beam forming and system use DSP processor for digital signaling. The performance of such antenna with high data rate transmit reduces signal interference.

I. “Rapid Beam Forming in Smart Antennas Using Smart-Fractal Concepts Employing Combinational Approach Algorithms”:

Smart antennas supply a wide variety of how to enhance wireless system performance. They supply increased exposures through vary expansion, gap filling, and higher structure dispersion. It use low gain array for network. In this paper an algorithm is made with using a fractal array and novel algorithm for rapid beam forming. An algorithm is expanded by utilizing “assignment of usage time and location tag algorithm”. Results of new method (algo.) reduce calculation time of array, expand allocation of resources for rapid beam and reduce memory requirement. After word a new method is invented for peer members in single base station and in different base station to enhance performance and optimization named as “combinational beam forming algorithm”.

J. “A review on a Constructive Smart Antenna beam forming technique with Spatial diversity”:

Smart antenna is achieving quality currently. The foremost vital stair in smart antenna is beam forming. With the help of it, we can perform a phase shifting and array weight on data not on hardware. In this article firstly all techniques used for beam forming are studied and seem that all methods give best result. A FIS and NN logic for beam forming with spatial diversity are used. For new method a genetic algorithm is utilized making dataset with help of a fuzzy and neural network is trained. A work is done in MATLAB and experimented by diverse input angle. A

result comparison is made with beam forming without spatial diversity and LMS at input 0 and 180 angles it seems a new method is better than old one or reduces interference also.

K. “Improvement of Energy Efficiency by Using Smart Antenna System of BTS Application”:

In GSM network an antenna at BTS radiates in all area of cell when a single user need and it effect people. This article give a solution for BTS a new smart antenna made with improved antenna array which produce more accurately direct radiation pattern and change time to time with phase changes at base station. A result shows that it reduce radiated energy and helps to overcome its transmission power in cell.

L. “Improvement of Spectral efficiency and power control of Smart Antenna”:

The smart antennas are antenna area with sensible signal process algorithms won't to determine spatial signal signature like the direction of arrival (DOA) of signal, also one in all the foremost vital processes is beam forming. Within its most significant performance in beam forming is ever-changing beam pattern of antenna for a selected angle. Within the algorithmic program, a collection of position and rate for angles and amplitudes of antenna currents has been generated to optimize answer in desired direction. The signal gain and interference magnitude relation area unit compared with genetic algorithmic program methodology. The factor that is throughout of in our methodology is unit interference, phase angle and range of patterns.

IV. CONCLUSION

Smart antenna is so an awfully immense topic and myriad scopes are there to execute researches. This research is slightly an analytical concept regarding the smart antenna where only the primary aspects are mentioned. In this research we analyze performance of smart antenna on MAC layer and problems occurring by BTS receiver. However smart antenna has several alternative feature with are worthy of being a topic of research. Topics like

- Adaptive Algorithm
- Diversity
- Switched beam Method

And in fact all the features will be applied altogether to the prevailing standards. We might attempt to investigate this whole feature step by step.

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