A REVIEW ON SMART ANTENNA FOR WIRELESS NETWORK

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Abstract: Due to the necessity to share information and increasing exchange, users are demanding a simple connectivity and quick network. Nowadays, users are very much interested in interconnecting all of their personal electronic devices by using Mobile ad hoc network. The capability of MANET is often restricted due to interference. Once a smart (spontaneous) antennas system is combined in ad-hoc network, we will attain good spatial range, decreasing the interference in network and therefore can able to increasing the capability of the network. During study of this paper we tend to examine the challenges at smart antennas system in ad hoc networks.

IndexTerms **- MANET, Ad-Hoc, Smart Antenna.**

I. INTRODUCTION

Firstly, A MANET was sponsored by the United States of America. A Mobile ad hoc network may be a wireless network of mobile nodes connected by a wireless link while not central management. Every node in a very MANET will move severally in any direction, so links to alternative devices can change oftentimes and every node makes its call supported the network state of affairs, with none reference infrastructure and nodes will so behave as routers or hosts. The utilization of smart antennas in cellular networks has enhanced capability by reducing interference and enabling abstraction utilize of spectrum. Generally these antennas are deployed at base-stations in these networks to sectorize the cells and focus transmissions in specific directions. A wise antennas is an array of antenna components that provided by signal process algorithms to boost the received signal.

II. SMART ANTENNA

Typically, a commercial hoc network uses omnidirectional antennas which might transmit and receive signals equally from all directions. Since 2 nodes communicate employing a given channel, all the opposite neighboring nodes keep silent. Therefore the capability of a commercial hoc network that uses such antennas is restricted.

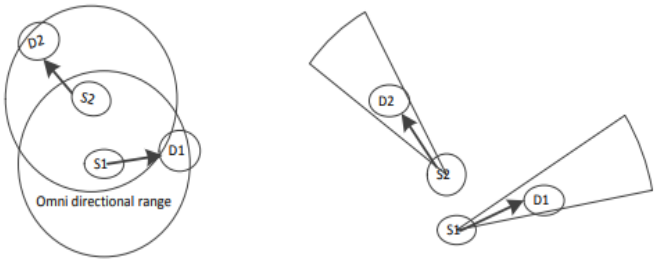

Fig1. Omnidirectional antennas and a smart antennas

The use of sensible antennas in wireless spontaneous networks has garnered attention over the previous couple of years. Given the distinctive capabilities of smart antennas, and the way they will improve performance in an exceedingly usually forced spontaneous network environment, the attention is with advantage. However, not a lot of light has been shed on wireless spontaneous networks that have nodes with varied antenna capabilities.

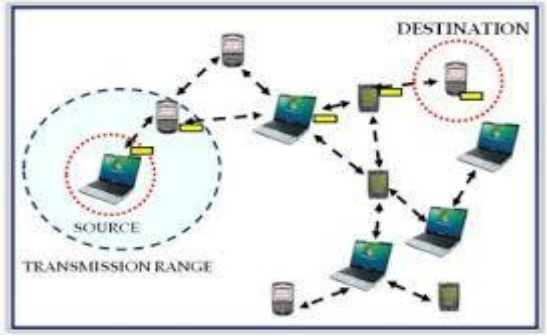

Fig 2: Ad hoc network environment

The popular Carrier Sense Multiple Access/Collision Detection (CSMA/CD) mac technique is employed for wired network. In CSMA/CD, once a node desires to send over the network, initial it senses the wire medium whether it's idle or busy. If it's idle, the node sends its information with sensing the medium regularly. Otherwise, the node delays its transmission to avoid a collision with existing packets. Whereas within the wireless networks, the signal strength is reciprocally proportional to the sq. distance from the transmitter node, thus nodes, that are out of transmitter's range, cannot sense the transmitted signal and will cause issues.

There are 2 styles of directional antennas systems: the primary one is Switched beam (sectorized) antenna systems during which multiple mounted beams are possible. The switched beam system presents a planned set of beams which may be chosen as applicable. For a switched beam antenna with K beams, the dimension of every beam is 2π/K radians. A directional transmission would then cowl one among these k fastened sectors as illustrated in Fig. 3.

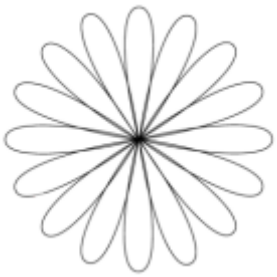

Fig3. Switched beam antenna system

The other sort is manageable beam systems (adaptive) during which the main lobe of the antenna are often centered toward the user of interest and nulls within the direction of the interference. Thus, if a node desires to communicate with its neighbor, it will adaptively steer its beam therefore on purpose the main lobe towards that neighbor in an exceedingly mobile situation in addition. Gain and directivity are intimately connected in antennas. Gain could be a measure of increase in power. The gain of a directional antenna is usually on top of that of an omni-directional antenna. Directional antennas will have larger directional vary as compared to an omni-directional antenna.

III. LITERATURE REVIEW

1. **A Survey on Smart Antenna System:** Smart Antenna system is that the one in all the foremost quickly developing areas of communications. This can be the survey of paper that shows principle and dealing of smart antennas and therefore the class of their applications in numerous fields such a 4G telephone system, the best quality of multi carrier modulations like OFDMA etc. The utilization of sensible antennas in mobile communications enhances the capabilities of the mobile and cellular system such a quicker bit rate, multi-use interference, space division multiplexing (SDMA), increase in range, Multi path Mitigation, and reduction of errors because of multi path weakening and with one nice advantage that's a really high security. The signal that's been transmitted by a smart antenna cannot be tracked or received the other antenna so making certain a really high security of the information transmitted. This paper additionally shows needed algorithms that are would like for the beam forming within the antenna patters. **("Savitri Katariya"2011)**

2. **Improvement of Spectral Efficiency and Power Control Of Smart Antenna:** The smart antennas are antenna arrays with smart signal processing algorithms used to identify spatial signal signature such as the direction of arrival (DOA) of the signal, and one of the most important processes is beam forming. In the most important function in beam forming is changing beam pattern of antenna for a particular angle. In the algorithm, to optimized solution in desired direction a set of position and velocity for angles and amplitudes of antenna currents has been generated. The signal gain and interference ratio are compared with genetic algorithm method. The factors that are considered in our method are interference, phase angle and number of patterns. **(" Swati Patidar, Kishor Kumbhare, Sanjay Chouhan"2017)**

3. **Use of Smart Antennas in Ad Hoc Network:** The capability of spontaneous networks are often severely restricted because of interference constraints. A way of using rising the general capability of spontaneous networks is by the employment of smart antennas. smart antennas enable the energy to be transmitted or received in an exceedingly specific direction as hostile diffusing energy in all directions. This helps in achieving important spatial re-use and thereby increasing the capability of the network. However, the employment of sensible antennas presents important challenges at the upper layers of the protocol stack. Specifically, the medium access management and therefore the routing layers got to be changed and created aware of the presence of such antennas so as to take advantage of their use. During this paper we tend to examine the assorted challenges that arise once deploying such antennas in spontaneous networks and therefore the solutions projected up to now in order to beat them. this state of the art appears to counsel that the preparation of such antennas will have an amazing impact in terms of accelerating the capability of spontaneous networks. **(" Mohammed Ali Hussain" 2010)**

4. **Integration of Smart Antenna System in Mobile Ad Hoc Network:** The capability of a Mobile Ad-hoc Network (MANET) will be severely restricted because of interference constraints. A technique of rising the general capability of ad-hoc networks is by the utilization of smart antenna system. SAS has the advantage over ancient omnidirectional antennas of having the ability to determine radio signals into the involved directions in either transmission mode or in reception mode. The

omnidirectional antennas in broadcasting over the entire network are the source of an excessive redundancy of broadcast packet receptions at intervals every node**.** **(“Mohammed A. Abdala and Areej K. Al-Zuhairy”2013)**

5. **Beam forming of Smart Antenna in Cellular Network Using Leaky LMS Algorithm:** One of the necessary technologies utilized in present day cellular network is adaptive smart antenna wherever cell site is in a position to communicate in desired direction solely and by minimizing unwanted interferences. This paper presents a changed least mean sq. algorithm referred to as leaky least mean sq. (LLMS algorithm for beam forming in smart antenna. Analysis of beamforming exploitation leaky LMS is finished supported main beam direction, null direction, most aspect lobe level (SLL max) and convergence by variable parameters like the step size and leak issue for various variety of antenna array components. (**“Ritika Sharma” 2018**)

6. **Design of a Smart Antenna for Mobile Ad Hoc Network Applications:** Among the mobile spontaneous networks appealing characteristics there are network which are reconfigurable and adaptable. During this context a wise antenna capable of self-configuring multiple high-directivity beams provides a significant advantage in terms of power saving, accumulated range, and spatial reuse of channels. during this paper a smart antenna fabricated from a cylindrical array of patches appropriate for MANETs is presented. **(“Marco Di Filippo”2014**)

7. **Window Based Smart Antenna Design for Mobile Ad Hoc Network Routing Protocol**: MANETs, consisting of mobile nodes, are self-organizing and self-configuring and hence can be deployed without any infrastructure support. MANETs also have some limitations such as short-life, unreliability, scalability, latency, high interference, and limited resources. Many innovations and researches have been done in this field to overcome these limitations. Incorporating smart antenna system with the mobile nodes is one of them. It has been shown in the literatures that smart antenna can improve network capacity, increase network lifetime, reduce delay, and improve scalability by using directional radiation pattern. (**AKM Arifuzzman)**

8. **Rapid Beam Forming in Smart Antennas Using Smart-Fractal Concepts Employing Combinational Approach Algorithms:** Smart antennas supply a broad range of how to boost wireless system performance. they supply increased coverage through range extension, hole filling, and higher building penetration. smart antennas use an array of low gain antenna components that are connected by a network. form ideas are employed in antenna arrays recently. The necessary properties of form arrays are frequency independent multiband characteristics, schemes for realizing low side lobe designs, systematic approaches to dilution, and also the ability to develop fast beam forming algorithms. During this paper, a trial has been created to use assignment of usage time and site tag algorithm for smart antennas combined with the form ideas to cut back the computational complexity and enhance resource allocation for fast beam forming algorithms. what is more, 2 combinative approach algorithms are planned for peer users among single base station and peer users between completely different base stations. **(“ Mounissamy Levy”2012)**

9. **Mobile Communication using Smart Antenna System:** It gives an idea on smart antenna system (SAS), for mobile wireless communications. The smart antenna system will definitely have a significant impact on the efficient use of the spectrum.SAS will also less the cost of new wireless mobile communications and thus will lead to optimization of service quality and realization of transparent operation across multi technology wireless networks. This paper presents brief account on smart antenna system. SAS thus removes out most of the co-channel interference and thus it results in better quality of reception and lower dropped calls. The paper, again gives an idea about the radiation pattern of the antenna and why it is highly preferred in its relative field. Cognitive Radio and OFDMA system again makes the efficient use of properties of SAS**. (“Rutuja Akarte”2018)**

10. **Mobile Communication Using SMART Antenna:** Smart or adaptive antenna arrays incorporates an array of antenna components with signal process capability, that optimize the radiation and reception of a desired signal, dynamically. Smart antennas will place nulls within the direction of interferers via adaptation to change of weights linked to every antenna component. They therefore get rid of most of the co-channel interference leading to higher quality of reception and lower dropped calls. Smart antennas may track the user at intervals a cell via direction of arrival algorithms. This means that they're additional advantageous than alternative antenna systems. This paper focuses on few problems concerning the smart antennas in mobile radio networks. **(“Dr. A. Jhansi Rani”2015)**

11. **Implementation of Smart Antenna in Mobile ad-hoc network:** Nowadays users demand easy connectivity and fast network connection for easily sharing of data. They want to connect all their PEDs in ad-hoc fashion so that they can connect to the network on move which is the major advantage of MANET. So Smart Antenna system (SAS) is implemented in this ad-hoc network so that users can easily connect to the network either they are at work or at home. **(“Supriya Kulkarni , Bhavani,”2014)**

12. **Beamforming of Smart Antenna:** Smart antenna are achieving quality currently a days. The foremost vital step in smart antenna is beamforming and therefore major advantage of beamforming is that phase shifting and array weighing can be performed on digital data rather than in hardware. These weights are accustomed steer the antenna array beam within the

direction of interest, thereby enhancing SNR. Now in this review paper I studied that beamforming in smart antenna along with spatial diversity using fuzzy inference system and neural network was projected. In this neural network and fuzzy inference system is trained by a dataset generated by genetic algorithm. The dataset is generated for angles individually and also for combinations of different angles. GA is one of optimizing technique works based on genetic concepts. In addition the proposed method increases the efficiency of the smart antenna. The comparative and analytical results prove the performance of the proposed method over the other existing methods. (“**Hardeep Singh, Gurwinder Kaur”2014)**

IV. PROBLEM STATEMENT

Present omnidirectional antenna radiates equally and symmetrically in all directions due to which interference in such antenna is very large. Whereas in smart antenna it first calculates the Direction of Arrival and then sends signals in that particular direction only.

Due to the requirement for increasing exchange and share information, users demand simple connectivity and quick network where they're. Recently, users have an interest in interconnecting all their personal electronic devices along using Mobile ad hoc network (MANET). The capability of ad hoc network will be restricted due to interference. once a smart antennas system is integrated in such network, we are able to reach important spatial reuse, decreasing the interference and thereby increasing the capability of the network. During this we'll examine the challenges at medium access control caused by integration of smart antennas system in spontaneous networks.

V. FLOW OF WORK

The First of all nodes are created in the network. These nodes show the view of the network. First of all the image view of the network is being created, which means we can specify the area in which we want nodes to be present. In this we can easily change the dimensions of the area in which we want nodes to be present. Nodes take random positions in the specified area but also consider the condition that it should not overlap the existing node. We are externally giving the input how many nodes we want in the network area and also specify the dimensions of the area.

By changing the number of nodes in the network we are actually changing the load of the network. The load of network having 4nodes present in the network is less than the network having 10 numbers of nodes. It also checks the condition either we are entering numeric value or not for specifying the number of nodes and the dimensions of the area. If not, then it shows the error.

Now in our next step these nodes are shown with their radiation pattern. Nodes present in ad-hoc network radiate in all directions forming an omnidirectional radiation pattern. So all nodes present in the network radiate equally in all direction forming a circular radiation pattern.

In ad-hoc network any node can be selected as transmitter or receiver. So nodes can communicate with any other node in the network. The nodes which are not communicating should not transmit their radiations to conserve their energy so they are not showing their circular radiation pattern. Only the nodes which are participating in the communication process are showing their radiation pattern.

VI. CONCLUSION

Due to interference constraints, the capacity of ad hoc networks can be severely limited a method of using up the general capability of spontaneous networks is by the utilization of smart antennas. Good antennas permit the energy to be transmitted or received in a very explicit direction as opposition disseminative energy in all directions. This helps in achieving vital spatial re-use and thereby increasing the capability of the network. However, the utilization of smart antennas presents vital challenges at the upper layers of the protocol stack especially, the medium access management and therefore the routing layers can ought to be changed and created alert to the presence of such antennas so as to take advantage of their use. We will examine the varied challenges that arise once deploying such antennas in ad hoc networks and therefore the solutions planned so far so as to overcome them. This state of the art appears to suggest that the preparation of such antennas will have a tremendous impact in terms of increasing the capacity of ad hoc networks. In future we will try to make smart antennas or say directional antennas in ad-hoc network which will overcome the shortcomings of the present omnidirectional antennas.

REFERENCES

[1]. Savitri Katariya, “A Survey on Smart Antenna System”, IJECT Vol. 2, Issue 3, Sept. 2011.

[2]. Patidar, S., Kumbhare, K., & Chouhan, S. (2017). “Improvement of Spectral Efficiency and Power Control of Smart Antenna. International Journal of Engineering Sciences & Research Technology”, 6(5), 736-741. doi:10.5281/zenodo.801268.

[3]. Mohammed Ali Hussain, P.Suresh Varma, K. Satya Rajesh, Hussain Basha Pathan, Leela Madhav Sarraju, “Use Of Smart Antennas In Ad Hoc Networks”, International Journal of Computer Science & Information Technology (IJCSIT), Vol 2, No 6, December 2010.

[4]. Mohammed A. Abdala and Areej K. Al-Zuhairy, “Integration of Smart Antenna System in Mobile Ad Hoc Networks”, International Journal of Machine Learning and Computing, Vol. 3, No. 4, August 2013.

[5]. Ritika Sharma, “Beamforming of smart antenna in cellular network using leaky LMS algorithm”ieeexplore.ieee.org/document/8405082.

[6]. Marco Di Filippo, Leonardo Lucci, Dania Marabissi, and Stefano Selleri, “Design of a Smart Antenna for Mobile Ad Hoc Network Applications”, Hindawi Publishing Corporation International Journal of Antennas and Propagation Volume 2015.

[7]. AKM Arifuzzman, Rumana Islam, and Mohammed Tarique, "Window Based Smart Antenna Design For Mobile Ad Hoc Network Routing Protocol", International Journal of Wireless & Mobile Networks (IJWMN) Vol. 7, No. 4, August 2015.
[8]. Mounissamy Levy, "Rapid Beam Forming in Smart Antennas Using Smart-Fractal Concepts Employing Combinational Approach Algorithms" International Journal of Antennas and Propagation Volume 2012, Article ID 467492
[9]. Rutuja Akarte 2018, "Mobile Communication using Smart Antenna System", International Journal of Innovations & Advancement in Computer Science IJIACS, ISSN 2347 – 8616 Volume 7, Issue 3,March 2018.
[10]. Dr. A. Jhansi Rani, "Mobile Communication Using SMART Antenna", International Journal of Research in Advent Technology (E-ISSN: 2321-9637) Special Issue 1st International Conference on Advent Trends in Engineering, Science and Technology "ICATEST 2015", 08 March 2015.
[11]. Supriya Kulkarni P, Bhavani V, "Implementing Smart Antenna System in Mobile Ad Hoc Networks", Int. Journal of Engineering Research and Applications, Vol. 4, Issue 6, June 2014, pp.74-79.
[12]. Hardeep Singh, Gurwinder Kaur, "A REVIEW ON A CONSTRUCTIVE SMART ANTENNA BEAMFORMING TECHNIQUE WITH SPATIAL DIVERSITY", International Journal of Advance Engineering and Research Development (IJAERD) Volume 1,Issue 6,June 2014, e-ISSN: 2348 – 4470
[13]. Karthikeyan Sundaresan, and Raghupathy Sivakumar, "Ad hoc networks using heterogeneous smart antennas: Analysing the performance and protocols", Wireless Communications and Mobile Computing Wirel. Commun. Mob. Comput. 2006; 6:893–916.
[14]. N. Makhlouf and P. Vajsar, "Mac Protocols in Mobile Ad Hoc Networks," Int. J. Adv. Telecommun. Electrotech. Signals Syst., vol. 1, no. 1, pp. 9–12, 2012.
[15]. M. A. Abdala and A. K. Al-zuhairy, "Integration of Smart Antenna System in Mobile Ad Hoc Networks," Int. Jouranl Mach. Learn. Comput., vol. 3, no. 4, pp. 342–346, 2013.
[16]. Salvatore Bellofiore, "Smart Antenna System Analysis, Integration and Performance for Mobile Ad-Hoc Networks (MANETs)", IEEE "Transactions On Antennas and Propagation", Vol. 50, NO. 5, MAY 2002.
[17]. Bindu Sharma, "An Introduction to Smart Antenna System", International Journal of Business and Engineering Research Vol. 8 Nov.2014 Issn:0975-0479.