International Journal of Emerging Trends in Engineering and Basic Sciences (IJEEBS)
ISSN (Online) 2349-6967
Volume 2, Issue 3(May-June 2015), PP 78-84

A New Wireless Communication Protocol IEEE 802.11KT for Higher Productivity of Agriculture Crop

Dr.V.K. Taksande [1], R. S.Lonkar[2,] V.R.Barwat[3]
[123]*(Department Elect. & Comm. Engg., PIGCE/ RTM Nagpur University, India)*

Abstract :- An Ad- hoc network consists of wireless mobile nodes which can self-organize freely and dynamically into network topology. Routing protocol AODV is for directing data packets from a source to a given destination. Our low power consumption and low delay new IEEE 802.11KT MAC protocol can be used for monitoring agriculture crop, to improve their productivity. This paper provides analytical observation of increase in productivity of certain agriculture crop when they are treated with our new wireless communication protocol.

Keywords: -AODV, IEEE 802.11KT MAC.

I. INTRODUCTION

During the last six decades, technological changes in agriculture and allied sectors backed by massive investment in irrigation, infrastructure and institutions have propelled many food-insecure, import-dependent developing countries, including India, into food self-sufficiency. The adoption of wireless communication biosensor network, biochemical and mechanical and biotechnology in India have led to near fourfold increase of food grain production and five-fold increase in production of fruits and vegetables during the period 1967- 68 to 2012-13.. The rapidly increase in population, which is likely to reach 1.5 billion by 2030, however, keeps the challenge of producing more food as significant as in the past. Besides, the demographic transformation, urbanization and sustained growth in income are causing a change in the dietary pattern, away from staple cereals towards high-value commodities like vegetables, fruits. It is projected that by 2030 India will require a minimum of 314 million tonnes of food grains, 179 million tonnes of vegetables, 99 million tonnes of fruits, (Joshi and Kumar, 2011). Balancing the growing food demand with domestic production is unlikely to be as smooth as in the past. Land will emerge as a strong limiting factor to food and agricultural production. India's net cropped area almost stagnates at around 160 million hectares; and the scope to increase food and agricultural production through area expansion is limited. According to an estimate, about 130 million hectares of land in the country suffers from one or the other form of degradation. Water is a critical and limited input in agriculture, which uses over 88 per cent of the available water. Groundwater in the intensively-cultivated northwestern food basket of the country has already reached its maximum limits of exploitation. The agricultural production will become more energy intensive but with a concomitant shift from the use of renewable to fast-exhausting non-renewable sources, (Jha *et al*., 2012). Intensification of agriculture will further strain these natural resources. Increasing competition for land, water and energy will intensify due to their pressing demands for housing and industrialization; and thus there is a high probability of their diversion away from agriculture. These challenges will be aggravated further by increasing frequency of extreme climatic events, such as droughts, floods, cyclones, heat waves, etc. Technology has been the key driver of agricultural growth in the past. In view of these challenges, the future growth in agriculture has to come from acceleration in the rate of technological change and sustainable intensification of the production systems. This paper examines the potential of some of the latest wireless communication biosensor mobile node technologies with biotechnology related to breeding of crops and natural resources management in improving food and nutritional security, and enhancing agricultural growth and rural development. This paper addresses a combination of two important technologies that is wireless communication biosensor mobile node technology and biotechnology that have considerable potential to influence agricultural growth and rural development. First, it discusses the wireless communication

biosensor mobile technology and its extent to improve agricultural productivity using this technology. Second, it explores the potential of frontier science like biotechnology, and information technologies in raising the agriculture crop production and its information.

The rest of the paper is organized as follows: The related work is provided in section II. The wireless communication network, IEEE 802.11KT protocol, AODV routing protocol is summarized in section III. The simulation environment is described in Section IV. We present the simulation results and observation in section V and the conclusion is presented in section VI

II. RELATED WORK

A Several researchers have done the qualitative and quantitative analysis of wireless communication technology with biotechnology on different crops. Bennett, R., U. Kambhampati, S. Morse and Y. Ismael[1] a study of the commercial growing of *Bacillus thuringiensis* (Bt) cotton in India, compares the performance of over 9,000 Bt and non-Bt cotton farm plots in Maharashtra over the 2002 and 2003 seasons. Results show that since their commercial release in 2002, Bt cotton varieties have had a significant positive impact on average yields and on the economic performance of cotton growers. Regional variation showed that, in a very few areas, not all farmers had benefited from increased performance of Bt varieties. Chand, R., P. Kumar and S. Kumar(2011),[2],biotechnology and wireless communication a large investments were made on research in agriculture in the country with the onset of green revolution during mid-1970s. This helped in the development and promotion of 'HYV seed — fertilizer — irrigation 'technology, biotechnology, wireless communication which had a high pay-off and a significant progress was made in food production. Initially, the improved technology was confined to a limited area but after mid-1980s, the country witnessed the spread of improved agricultural technologies to a wider area which continued through the early years of 1990s. However, the productivity growth attained during the decades of 1975-95 could not be sustained during the decade of 1996-05 for a number of important crops. Also, some areas and a few crops did not benefit much from the technological breakthroughs of green revolution period. In recent years, the crop sector has been experiencing diminishing returns to input-use and a significant proportion of the gross cropped area is facing deceleration or stagnation in the TFP growth. In some cases, the TFP has even shown a decline.

III. WIRELESS COMMUNICATION AD-HOC MOBILE NETWORK

A Wireless Communication Mobile Networks represents a system of wireless mobile nodes that can freely and dynamically self-organize in to arbitrary and temporary network topologies, allowing every node placed with the crop within that area to seamlessly communicate without any pre-existing communication architecture. Each node in the network also acts as a router, forwarding data packets for other nodes. In Ad-hoc network, an IEEE 802.11 Mac protocol with Ad hoc On Demand Distance Vector (AODV) routing protocol is used for communication and to find routs efficiently between two communicating nodes.

A. IEEE 802.11KT MAC PROTOCOL

The MAC 802.11KT protocol modifies the IEEE 802.11 RTS/CTS handshake on transmitter (RTS) and receiver (CTS), respectively. This protocol modifies IEEE 802.11 for various inter frame space, contention window for minimum and maximum size to obtain high system throughput and small end to end delay. This protocol modifies the security mechanism, power management mechanism, synchronization mechanism, association and reassociation mechanism of nodes with access point. It also modifies management information base required for network management purpose for external entities. Our goals is to obtain the maximum throughput, less numbers of data packets dropped, high packet delivery ratio and small end to end delay by the 802.11KT protocol as compared to that of the conventional 802.11 system. Numerical evaluation of the

proposed analysis framework indicates that the 802.11KT protocol system can provide a significant increase in throughput and decrease in end to end delay for any type of topology in MANET. Hence it is very much suitable as low cost wireless protocol in rural villages for communication.

B. Ad Hoc On-Demand Distance Vector (AODV)

Ad hoc On Demand Distance Vector (AODV) [1] is a reactive routing protocol which initiates a route discovery process only when it has data packets to send and it does not know any route to the destination node, that is, route discovery in AODV is "on-demand". AODV uses sequence numbers maintained at each destination to determine freshness of routing information and to avoid the routing loops that may occur during the routing calculation process. All routing packets carry these sequence numbers.

a. Route Discovery Process

During a route discovery process, the source node broadcasts a route query packet to its neighbours. If any of the neighbours has a route to the destination, it replies to the query with a route reply packet; otherwise, the neighbours rebroadcast the route query packet. Finally, some query packets reach to the destination.

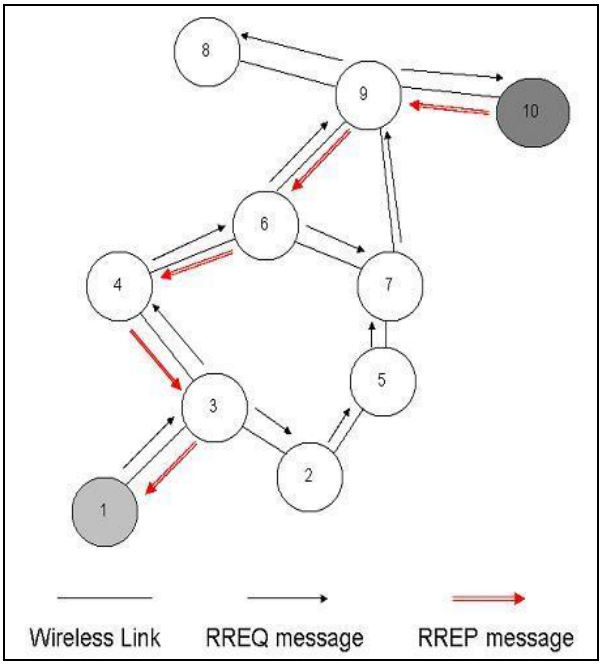


Fig 1. AODV Route Discovery Process

"Fig. 1" shows the route discovery process from source node1 to destination node 10. At that time, a reply packet is produced and transmitted tracing back the route traversed by the query packet as shown in "Fig. 1".

b. AODV Route Message Generation

The route maintenance process in AODV is very simple. When the link in the path between node 1 and node 10 breaks the upstream node that is affected by the break, in this case node 4 generates and broadcasts a RERR message. The RERR message eventually ends up in source node 1.After receiving the RERR message; node 1 will generate a new RREQ message (Fig. 2).

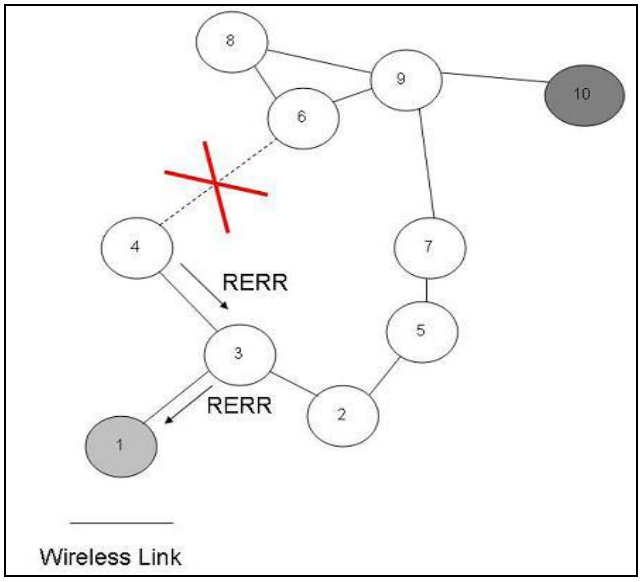
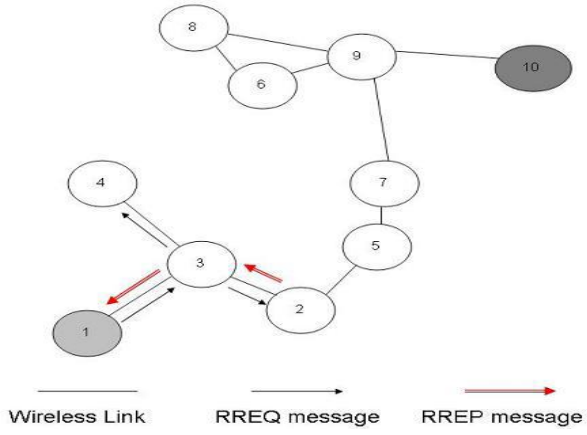


Fig 2. AODV Route Error Message Generation

c. AODV Route Maintenance Process

Finally, if node 2 already has a route to node 10, it will generate a RREP message, as indicated in Figure 3.Otherwise, it will re-broadcast the RREQ from source no1 to destination node 10 as shown in "Fig. 3".



IV. SIMULATION MODEL

This section have given the emphasis for the simulation of performance of IEEE 802.11 MAC protocol and 802.11KT MAC protocol with AODV as routing protocol varying the mobility of mobile nodes. The simulations have been performed using network simulator NS-2 [12]. The network simulator ns-2 is discrete event simulation software for network simulations which means it simulates events such as sending, receiving, forwarding and dropping packets. The latest version, ns-allinone-2.34, supports simulation for routing protocols for ad hoc wireless networks such as AODV, TORA, DSDV, and DSR. Ns-2 is written in C++ programming language and Object Tool Common Language (OTCL). Although ns-2.34 can be built on various platforms, we chose a Linux platform [FEDORA 7] for this paper, as Linux offers a number of programming development tools that can be used along with the simulation process. To run a simulation with ns-2.34, we have written the simulation script in OTCL, got the simulation results in an output trace file. The performance metrics are calculated using AWK file and the result graphically visualized. Ns-2 also offers a visual representation of the simulated network by tracing nodes movements and events and writing them in a network animator (NAM) file.

A. Simulation Parameters

We consider a network of nodes placing within a 2200m X 500m area. The performances of IEEE 802.11 MAC and 802.11KT MAC are evaluated by keeping the network payload constant and varying the mobility of mobile nodes. Table 1 shows the simulation parameters used in this valuation.

TABLE 1: PARAMETERS VALUES FOR SIMULATION

Simulation Parameters	
Simulator	ns-2.34
MAC Protocols	802.11,802.11KT
Simulation duration	150 seconds
Simulation area	2200 m x 500 m
Number of nodes	50
Transmission range	250 m
Movement model	Random topology
Routing Protocol	AODV
Maximum speed	5,10,15,20,25,30m/s
Packet rate	4 packets/sec
Traffic type	CBR (UDP)
Data payload	512 bytes/packet

V. SIMULATION RESULTS & OBESRVATION

Figure. 4 indicates 50 numbers of mobiles nodes in agricultural land. Figure 5 indicates the data packet transmission between nodes that contains information about soil. In figure 6, Blue colour column indicates the production of rice with new IEEE 802.11KT MAC protocol. Red color column indicates rice production with traditional method. From the experimental result and from the graph, it is observed that rice crop with biosensor wireless communication using our newly designed IEEE 802.11KT protocol have more productivity capacity than rice crop with traditional method.

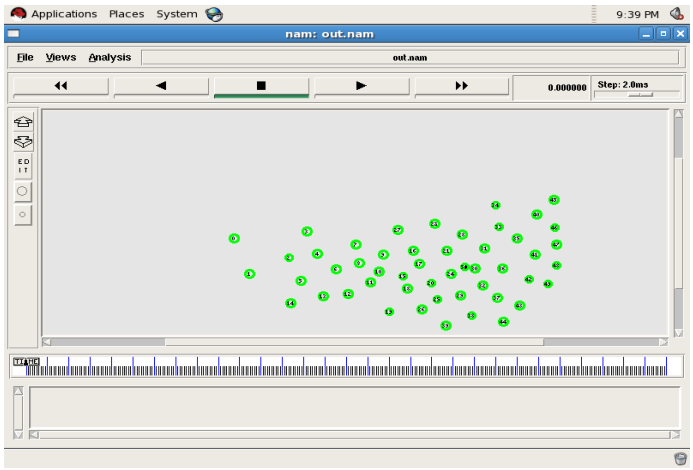


Fig 4. 50 Numbers of Nodes In Agricultural Land.

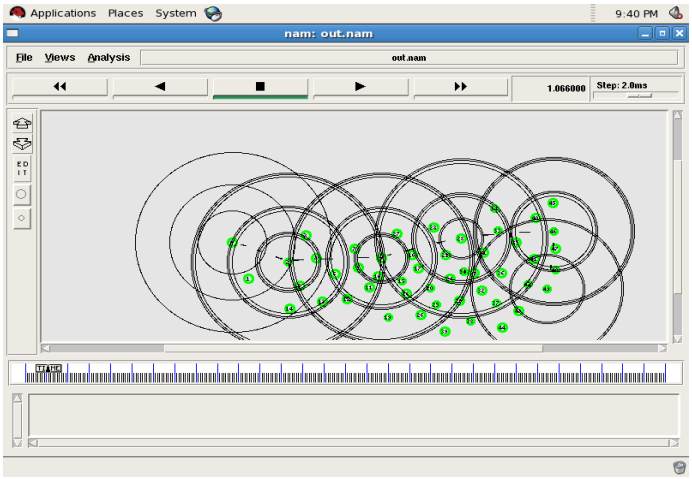


Fig 5. Data Packet Communication between Nodes.

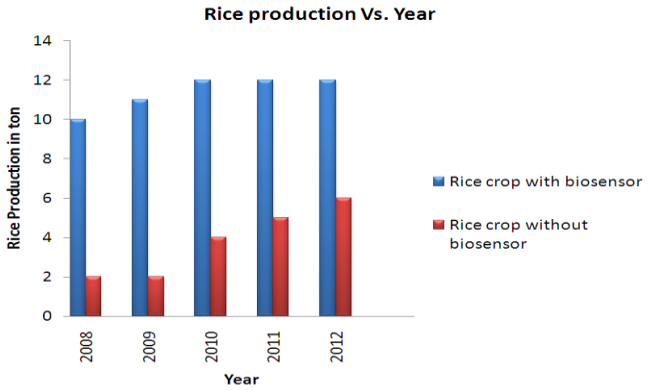


FIG 4. RICE PRODUCTION VS. YEAR

VI. CONCLUSION

Latest digital and wireless communication mobile node technology with our newly designed IEEE 802.11KT MAC protocol can be used to increase the productivity of agricultural crops. Though it is not a complete solution for all the problems that farmers are facing but its application along with the conventional technologies can make significant contributions towards improving agricultural productivity and food and nutritional security. The experimental result of this paper shows that agricultural productive capacity of crop can be increased approximately 4 to 7 times if the crops are cultivated with modern technology like our newly designed IEEE 802.11KT MAC protocol wireless communication technology than the traditional cultivated technology.

.

REFERENCES

1. Bennett, R., U. Kambhampati, S. Morse and Y. Ismael (2006),"Farm-Level Economic Performance of Genetically Modified Cotton in Maharashtra, India", *Review of Agricultural Economics*, Vol. 28,No.3, pp.59–71.

2, Chand, R., P. Kumar and S. Kumar(2011), *Total Factor Productivity and Contribution of Research Investment to Agricultural Growth in India*, Policy Paper 25, National Centre for Agricultural Economics and Policy Research, New Delhi.

[3] C.E. Perkins & P. Bhagwat, "Highly Dynamic Destination Sequence-Vector Routing (DSDV) for Mobile Computers", Computer Communication Review, 24(4), 1994, 234-244.

[4] Das,S.R., Perkins,C.E., and Royer,E.M. (2000). Performance Comparison of Two On Demand Routing Protocols for Ad Hoc Networks. *IEEE INFOCOM 2000. Nineteenth Annual Joint Conference of the IEEE Computer and Communications Societies, pp.3-12.*

[5] Chao,C-M., Sheu,J-P.,and Hu,C-T. (2003). Energy- Conserving Grid Routing Protocol in Mobile Ad Hoc Networks. *IEEE Proceedings of the 2003 International Conference on Parallel Processing (ICPP'03).*

[6] Park,S.M., Ko,Y.B., and Kim,J.H. (2003). *Disconnected Operation Service in Mobile Grid Computing*. Graduate School of Information and Communication, Ajou University, South Korea.

[7] Perkins,C.E., Royer,E.M., Das,S.R., and Marina,M.K. (2001). Performance Comparison of Two On-Demand Routing Protocols for Ad Hoc Networks. *IEEE Personal Communications, 16-28.*

[8] Perkins,C.E., and Bhagwat.P. (1994). Highly Dynamic Destination-Sequenced Distance-Vector Routing (DSDV) for Mobile Computers. *ACM, pp.234 – 244*.

[9] Phan,T., Huang,L. and Dulan,C. (2002) Challenge: Integrating Mobile Wireless Devices Into the Computational Grid. *ACM , pp. 271-278.*

[10] Irving,M., Taylor.G., and Hobson.P. (2004). Plug in to Grid Computing. *IEEE Power & Energy Magazine, March/April, pp.40-44.*

[11] Kaneda,K., Taura,K., and Yonezawa,A., (2004). Routing and Resource Discovery in Phoenix Grid-Enabled Message Passing Library. *IEEE International Symposium on Cluster Computing and the Grid, pp. 670-671.*

[12] Rajsbaum,S. (2002). Distributed Computing Research Issues In Grid Computing. *ACM SIGACT News Distibuted Computing Column 8, pp.50-67.*

[13] Roy,N., Das.S.K., Basu.K., and Kumar.M. (2005). Enhancing Availability of Grid Computational Services to Ubiquitous Computing Applications. *Proceedings of the 19th IEEE International Parallel and Distributed Processing Symposium (IPDPS'05), pp.1-10.*

[14] Staub.T., (2004). Ad-hoc and Hybrid Networks: Performance Comparison of MANET Routing Protocols in Ad-hoc and Hybrid Networks. *Institute of Computer Science and Applied Mathematics, University of Berne, Switzerland, pp.1-38.*

[15] The NS2 Manual, 2005.

[16] Josh Broch , David A. Maltz , David B. Johnson , Yih- Chun Hu ,Jorjeta Jetcheva, *A performance comparison of multi-hop wireless ad hoc network routing protocols*, Proceedings of the 4th annual ACM/IEEE international conference on Mobile computing and networking, p.85-97, October 25-30, 1998, Dallas, Texas, United States.

[17] Md. Anisur Rahman, Md. Shohidul Islam, Alex Talevski "Performance Measurement of Various Routing Protocols in Ad-hoc Network" Vol I, IMECS 2009 International Multi Conference of Engineers and Computer Scientists, March 18 - 20, 2009, Hong Kong.