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Farm Field Protection with Sensor Networks

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Abstract **- This is a paper about Wireless Sensor networking system for farmlands which share boundary of forest area. This project helps to protect farmlands from wild animals. We concentrate on self managing, cost effective and energy efficient system. Wireless Sensor Networking System is a simple interlinked group of sensor nodes. Sensor nodes are deployed near farmland boundaries and on intrusion by animal sensor nodes passes data to nearby nodes. The main node catches the data, process it and retransmit the same to sensor field. The module that receives the data produces high frequency signals and led flashes so as to drive away the intruders.**

I. INTRODUCTION

The basic idea for farming Watchdog comes from ripples in water. When there is disturbance in calm water ripples are formed which travel to the water boundary and comes back to point where disturbance is created. Correspondingly sensor nodes are deployed in a layered fashion like primary, secondary, tertiary group of nodes. Here nodes are classified into two types' Master node and slave nodes. Slave collects data from farm lands and sends to nearby node only when event occurs. Then data received node will pass to the nearby node, that node may be a slave node or a master node .The master node collects data, calculates the direction of event then retransmits the steps to encounter the situation, i.e. The event occurred node is kept inactive the surrounding nodes in a V shape will create situation to drive away intruded animal. Led flash and high frequency (above 40 KHz) signals are used. To detect animal presence a PIR sensor is used. In Farmlands wired connection is not possible because of weather and long distance so here we used RF transmission. This Wireless transmitter's units use 433-MHz band. This module is cheap as compare to other wireless transmission. The transmitter module accepts the data from receiver. Amplitude Shift Keying (ASK) modulation technique used in RF transmission. Range of transmitter is 100 meters when operated at 12V. If it is operated with 5V then range will be 50-60 meters. Range will also depend on receiver sensitivity.

II .PROPOSED IMPLEMENTATION

Sensor nodes are deployed in groups, this group of nodes is connected to a common node and common node to the main node .The three parts of sensor deployment is primary secondary and tertiary. The primary node controls the network, secondary nodes passes data from tertiary to primary node. By including more sensor nodes more farm areas can be covered. Except the node in primary all other nodes are connected with PIR (Passive Infrared) sensor. Each sensor node is fixed with 433 MHz RF transceiver.

A. *Data packet*

Bit by bit transmission of data is used in this project .To avoid complexity in communication two dedicated pins of microcontroller unit (MCU) is used for transmission and reception instead of one pin for both. Data is transmitted in a packetized format .The packet starts with a high bit, low bit and high bit i.e. 101 each individual bit is given a proper time delay(t).After that the line ,4xt time delay is kept low, because 101 can occur any time in a communication medium. Then line is made high bit of t delay is to acknowledge that data is going to start ,next 8bit is data .The packet is end with a high and a low bit. The net packet is in the format 101 8bitdata 10 total 13 bit which can be extended to a standard packet format, which is not needed for this project.

B. *Method of Operation*

When an animal comes in the vicinity of sensor node(T) ,it sends a packet of data to group owner node(S) that node forwards data to primary node .Each node is assigned with binary two bit address.Decoding the packet reached in primary node it comes to know animal position. Then the primary node sends data to that particular direction nodes except the node where the animal intrusion occurred i.e. the activated nodes forms a semicircle with respect to the animal and generates high frequency signal (greater than 20 KHz) .The animals finds disturbance coming from every corner except the path it entered the field which will result in fall back of the animal from field. This meant for elephants but it is effective for all animals

and birds. The fig 1 shows sensor node deployment architecture in a farm land. T indicates tertiary nodes , S secondary nodes, P primary node located near a station .The black outline with nodes (T1 T2 T3 S1) is a group of nodes with S1 as head node. Likewise other group of nodes are (T1 T2 T3 S2), (T1 T2 T3 S3) and (T1 T2 T3 S4) .Each group is indicated with different symbols such as solid circle, solid triangle, solid diamond ,solid semicircle.

To avoid interference of nodes between groups these group of nodes($T_{n)}$ under header node is given a common node address i.e. address of the header node(S_n).

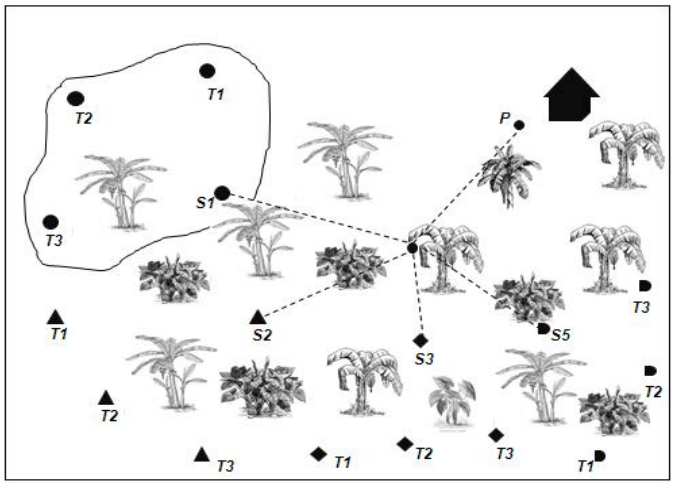

Fig . 1 Sensor deployed farmland

As an example let's assume animal intrusion occurred at T9 node, T9 generates a data packet then forwards to S3 node then to primary node .The packet will be in the format 10100001 8bitdata 10.This 8bit data is the address of nodes where communication is going on. In this example, initial packet generation is at T_1 node of group S_3 where address of T_1 is 00.Alsogroup address is added to data packet .T_1 belongs to group S_3 address 10 given in fig 2.This packet is transmitted to secondary node .Here packet is received and sends the packet again to next level .The above two steps continuous until it reaches the primary node or the 8bit data packet overflows. Here there is only three levels out three one is primary level rest two are only levels which adds the address .The primary node upon receiving the data packet decodes it and understands region of animal intrusion and sends activation signal to the neighboring nodes expect the node under suspicion of intrusion.

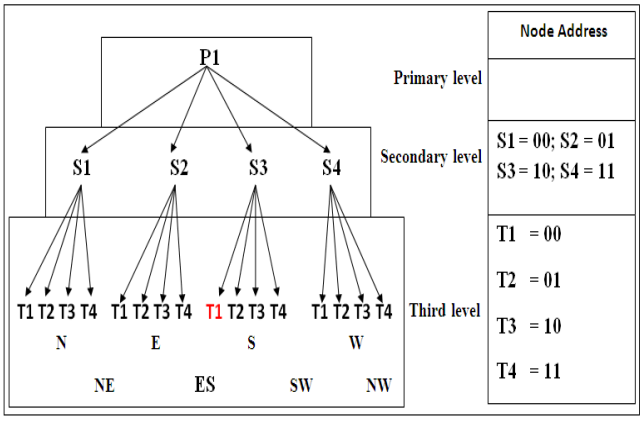

Fig 2. Working diagram

N, E, S, W denotes north, east, south, west respectively. NE, ES, SW, NW corresponds to north east ,south east, south west, north west. In the above structure total end nodes, tertiary nodes are sixteen which is controlled by four secondary nodes. In turn connected to one primary node .In case primary node goes wrong whole network is lost.To avoid this two primary nodes are used .A confusion arise here is what will happen if secondary node fails. This problem also has a solution to divert the node under that node to neighboring node, which makes the project complex .So we avoided that portion assuming that nodes won't fail.

III . CONCLUSION

The project farming watchdog is a basic project for farm field protection it aims on low cost, low energy consuming, small sensor nodes. More additional features like collision detection and avoidance can be included in case of two consecutive transmission and reception .Sensors can be included to detect presence of water in particular area. This project can be used for any type of intrusion whether it is an animal or not. As mentioned above, the project works on basis of no node fails. For making a perfect farm protection system all the point are to be included.

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REFERENCE

[1] Kazem Sohraby, Daniel Minoli,Taieb Znati , *Wireless Sensor NetworksTechnology, Protocols, and Applications* , A John Wiley &sons,inc., Publications,2003

[2] Holger Karl and Andreas Willig, *Protocols and Architectures for Wireless Sensor Networks.* , John Wiley & Sons, Ltd. ,2005

[3] Feng Zhao, Leonidas J. Guibas, *Wireless Sensor Networks: An Information Processing Approach*, Morgan Kaufmann Publishers,2005

[4] Jamal N Al- Karaki, Ahmed E.Kamal , *Routing techniques inWireless sensor Networks:A survey*, Department of Electrical and Computer Engineering lowa State University,Ames ,lowa 50011

[5] Anna Ha´c , *Wireless Sensor NetworkDesigns*, John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester,West Sussex PO19 8SQ, England , University of Hawaii at Manoa, Honolulu, USA

[6] Jason Lester Hill , *System Architecture for Wireless Sensor Networks*, Univerisy Of California, Berkeley, Spring 2003