International Journal of Engineering Research and General Science Volume 2, Issue 4, June-July, 2014
ISSN 2091-2730

WNS for Agricultural Monitoring & Development

Piyusha D.Patil, Prof N.A.Dawande

E-mail- piyushapatil23@gmail.com

Abstract— By taking into account rapidly increasing population of India, it being difficult fulfill basic needs of mankind. To overcome this issue one solution is to increase the agricultural productivity in terms of quantity as well as quality. Unfortunately farmers are affected due to unhealthy climate for the crops. It results in degradation of agricultural products quantity wise & quality wise. If we implement the system which will help farmer to monitor climatic conditions on regular basis So that he can analyze data & can take preventive actions accordingly. In this article we are going to implement the system to monitor the environmental conditions & control the environmental condition as much as possible. The parameters that we are going monitor includes temperature, light, humidity, soil moisture, motion detector etc. While data is being collected the system itself will take action to maintain the healthy climate for the crops. Whatever action is being taken by the system will be be immediately informed to framer via sms. In case farmer do not need to maintain the climate, then he can refuse the automatically action taken by system through sms. In this way framer is having control on the farm's climate all time & from anywhere. To implement this design we are going to use microcontroller ie. PIC 18F4520, sensor block, Radio Frequency module ie.RF module CC2500&GSM ModulenumberSIM900DHere we will implement wireless sensor nodes that are designed by using RF Module. These nodes will collect information related to farm's environmental condition. On receiver side RF receiver will receive data & will transfer it on operator's computer where it will be stored. If Temperature is rising above certain level which will be harmful for crop then microcontroller will make fan ON until temperature will be maintained. At the same time, if soil moisture is below required level then controller will make motor ON for required amount of time. This action taken by the system is informed to farmer through sms by using GSM Module. In this way farmer will have control on the farm's conditions.

Keywords— WSN, Radio Frequency Module, PIC Microcontroller, Environmental Parameters, GSM Module, Automatic Preventive Actions, Control Through SMS

INTRODUCTION

Here we are going to implement the system to help farmers to monitor the environmental conditions. Also this system can maintain the farm's climate so that crops will grow in the healthy environment. In this way this design will help farmers to increase quantity of agricultural product by default quality will also be maintained.

As we all are aware of the fact of increasing population & degradation of agricultural products due to polluted environment. These two issues are badly affecting the basic fulfillments of specially lower class population. One solution to minimize this issue is to concentrate on development of agricultural sector, by using the different techniques

We know that wireless sensor network has several advantages, like it minimizes the complexity, wireless less systems are easy to handle, these systems are cost efficient, low power requirement, easy to install, small in size, so now a days it has become more popular and are being used in wide range. Due to above mentioned benefits WSN is used in military, healthcare, domestic & agricultural sectors effectively.

WSN is made up of number of wireless nodes, which are connected to central operator. These networks can be from simple star network to complex multi hope wireless mesh networks. The type of network can be decided as per our requirement. Here range of Radio frequency node is up to 30 Meters. So number of nodes are used to collect the data from whole area to be monitored. The data which is being collected includes the information regarding temperature, moisture, humidity, obstacle detection, soil moisture etc. This data is sensed by the different sensor that are going to cover different area of the farm. Now this collected data will be sent to the central PC via RF trans-receiver. On other end it is collected by the RF trans-receiver And is being sent to the PC, where it will stored. The collection and storing of the data is done on regular basis. The collected data is being analyzed by microcontroller, to check whether it is in safe limit or not. If it is safe then no action is taken, and if it will be unsafe then preventive action will be taken by microcontroller. Whatever action is taken it informed to farmer via sms, Sms is sent by using GSM module. In this way by using the concept of WSN for monitoring & development we are not only monitor the environmental condition but also going to maintain it as far as possible. So this system will help farmer to improve the productivity of farm.

2.LITERATURE REVIEW

In last couple of years many researchers have focused on agricultural development with help of wireless sensor network. As we know in agricultural sector plays most important role in life of Indian economy as well as common man's day today life. In Iindia 70% of population is engaged in agriculture. Traditionally methods of developing agricultural lands has several drawbacks, & most time

consuming processes. But nowadays technology has been developed tremendously which can be helpful in optimizing better results from agricultural sector.

This can be achieved by providing healthy environmental condition for the agricultural land. So it is necessary to monitor the climatic condition of the agricultural land. In ref.[1] Herman Sahota, Ratnesh Kumar and Ahmed Kamal have implemented WSN for agriculture using MAC protocol for multiple power modes as well as for synchronization between nodes. In ref.[2] XinYue, Haifeng Ma, Yantao Wang used the zig bee technology to monitor climatic conditions of the coal mine.In ref.[3] JoobinGharibshah, SeyedMorsalGhavami, MohammadrezaBeheshtifar, and Reza Farshiued the neural network for monitoring & sensing drought conditions in Iran. Ref[4] Sahota H, Kumar R, Kamal A, Huang J. have desined energy efficient nodes where data has been collected periodically.

From all the above overview we came to know that Using WSN we can monitor the environment of a greenhouse. The size must be as small as possible so that the nodes can provide with many particular applications, also there is limited resource of power processing and computing for actor sensor nodes. The decision making unit is used to process the necessary action for the sensors to sense the environment.

The devices are mostly based on event driven model to work efficiently within the constrained memory. Wireless sensor networks consist of tiny devices that usually have several resource constraints in terms of energy, processing power and memory [2]. The miniaturization and continuous advancements in wireless technology have made the development of sensor networks to monitor various aspects of the environment increasingly possible. The concept of wireless sensor networks is based on a simple equation:

Sensing + CPU + Radio frequency nodes = Thousands of potential applications

As soon as people understand the capabilities of a wireless sensor network, hundreds of applications come into the mind. It is a very good combination of modern technology to emerge in recent years. An effective wireless sensor network requires a combination of the sensors, radios and CPU's with proper understanding of the both capabilities and limitations of each of the underlying hardware components, as well as a correct understanding of modern networking technologies and distributed systems theory. Whether powered by a battery or an energy-scavenging module in wireless sensors, the prime concern is the power efficiency.

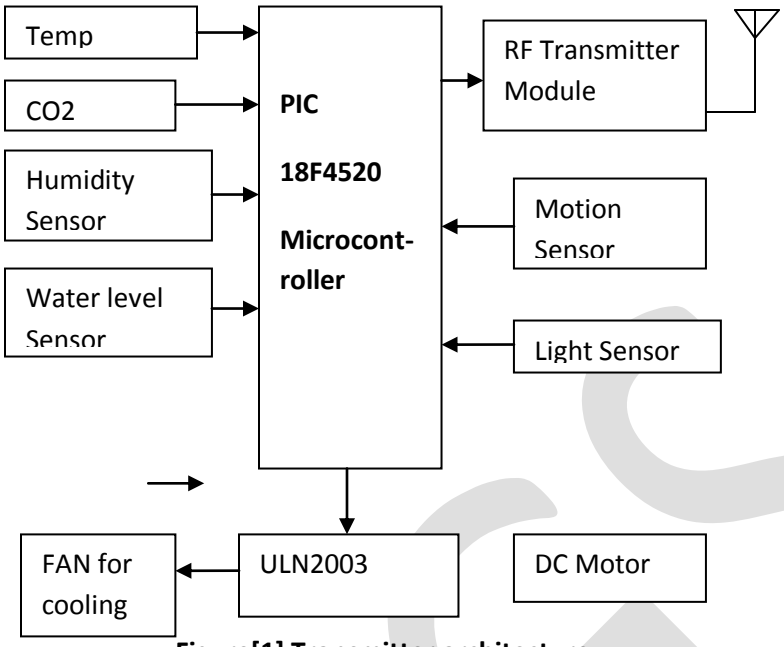
3.OVERVIEW OF THE SYSTEM

In our system there are following main equipments which play important role in system design

- One master PC terminal
- Three slaves terminals
- RF module CC2500

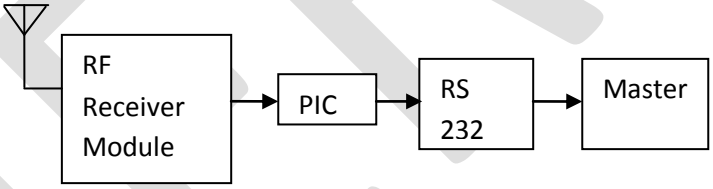
The basic idea which we are going to implement is that we are going to design number of nodes to cover different parts of farm. So we are placing three slaves which will be placed in such a way that they will be always in the range of PC master.

Where we are going to use the PHP software. In PHP we are going to maintain all the information regarding farm conditions with is node number.



Figure[1] Transmitter architecture

Above architecture is single unit for single area. Likewise we are going to design different modules for different area.
Each of these modules will be provided with the unique identity number or code. Here as we can see in the above block diagram we have used different sensors to monitor the environmental conditions.
As well as we have provided with the relay which is going to operate the fan & motor depending on the requirement, or the collected data from the sensor



Figure[2]Receiver side

4.BLOCK DIAGRAM

As shown the above Block diagram ie fig.[1] there are slaves which are transmitter or nodes, which will collect data from different nodes. Where different sensors have been connected to the node. Now this collected data will be analyzed by the PIC microcontroller, also this data is sent to master PC to maintain all the data. By analyzing this data PIC will decide which preventive actions has to be taken to maintain required climate for the particular plant.

CC2500 RF MODULE

It is the radio transreceiver which is provided with RF communication at 2.4GHz. It transmits and receives data at 9600 baud rate. It half duplex it provides communication in both direction but in one direction at atime. It supports following features

- Supports Multiple Baud rates (9600)
- Works on ISM band (2.4 GHz)

· Designed to be aseasy to use as cables.

· No external Antenna required.

· Plug and play device.

· Works on 5 DC supply.

MASTER PC

In this project the master PC is maintaining the collected data.

This is done by using PHP software. We are going provide with the monitored data time to time by displaying it on PC screen time to time. As well as it will provide information to the operator time to time. Which will be helpful for operator to maintain the climatic conditions. The host terminal PC is connected via RF transreceivermodule technology and RS 232 communication. RF transreceiver module is wireless sensor network can pass signals through wall and can be implemented where wired network is difficult to establish & maintain. The wireless technology advancement makes it possible to establish a network by placing the communicating nodes at the required places and switching on the transmitters in them. RF transreceiver can cover area upto 30 Mt. so by using number of nodes we can make whole area to be covered.

COLLISION AVOIDANCE PROTOCOL

As we know slave sends a request to the master, on other hand master gives response to slave's request. But it may happen that number of slaves are sending request at a time, in such cases collision may occur during communication. To avoid such critical situations we are going to use a master request and slave response protocol. Here master requests to slave in this frame it is provided with slave ID. This request is forwarded to all slaves. This request frame is received by all slaves & this request frame is stored in the slave. If in the frame slave ID matches with its own slave ID then in that case slave sends response to the master in form of collected parameter like temp, humidity etc. If the ID sent by the master.is not matching with its own ID then this request from the master is ignored.

5.HARDWARE DESIGN

The hardware components ement this system are summarized as follows-

Hardware Component:

1. PIC 18F4520 (LPC 2138)
2. Radio frequency transreceiver CC2500
3. Temperature Sensor [LM35D]
4. Light Sensor[LDR]
5. Humidity SHT75
6. Motion sensor
7. Level Sensor
8. 2.4 GHz SMA antenna
9. RS232
10. Relay ULN 2003

6.ACKNOWLEDGMENT

We would like to express our sincere thanks to our guide Prof. N. A. Dawande for his valuable guidance. We would like to thank our M.E. coordinator Prof. R.Sathyanarayan for his support & co-operation throughout seminar work.We thank our Head Of the Department Prof. M.M.Mukhedkar for his complete support, references and valuable suggestions.We are grateful to all teaching and non teaching staff of E&Tc Engineering department of Dr.D.Y.Patil.College of Engineering, Ambi,Pune, for the help.

7.CONCLUSION

The aim of this project is to monitor the environmental conditions of farm or green house, also to sense the water availability from water resource. Provide all the information to the central PC. As well as to control or to maintain the environmental condition by taking immediate preventive action.In this way by using WSN we can monitor & maintain the environmental condition of farm or green house efficiently.

REFERENCES:

[1] Herman Sahota*, Ratnesh Kumar and Ahmed Kamal on" A wireless sensor network for precision agricultureand its performance", Wirel.Commun.Mob.Comput. 2011; 11:1628–1645 Published online 2011 in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/wcm.1229

[2]Comput.& Inf. Eng. Coll., Heilongjiang Inst. of Sci. & Technol., Harbin, China ; XinYue ; Haifeng Ma ; Yantao Wang "Design of coal mine gas monitoring system based on zig-bee.", Future computer science & education 2011 international conference

[3]JoobinGharibshah, SeyedMorsalGhavami,MohammadrezaBeheshtifar, and Reza Farshi , "Nationwide Prediction of Drought Conditions in Iran Based on Remote Sensing Data" IEEE Transactions On Computres, Vol. 63, NO. 1, Janaury 2014.

[4] Sahota H, Kumar R, Kamal A, Huang J. An energyefficientwireless sensor network for precisionagriculture..In *Proceedings IEEE Symposium on Computersand Communications*. IEEE Computer Society: Riccione, Italy, June 2010; 347–350. [Online].Available: http://doi.ieeecomputersociety.org/10.1109/ISCC.2010.5546508.

[5] Sahota H, Kumar R, Kamal A. Performance modelingand simulation studies of MAC protocols in sensornetwork performance. In *Proceedings InternationalConference on Wireless Communications and MobileComputing*. ACM: Istanbul, Turkey, July 2011.

[6] ZamalloaMZn, Seada K, Krishnamachari B, Helmy A.Efficient geographic routing over lossy links in wirelesssensor networks. *ACM Transactions on SensorNetworks* June 2008; **4**: 12:1–12:33. [Online]. Available:http://doi.acm.org/10.1145/1362542.1362543.

[7] Lee S, Choi J, Na J, Kim C-k. Analysis of dynamiclow power listening schemes in wireless sensornetworks.*Communications Letters* January 2009; 43–45. [Online]. Available: http://portal.acm.org/citation.cfm?id=1650422.1650437.

[8] Bianchi G. Performance analysis of the ieee 802.11distributed coordination function. *IEEE Journal onSelected Areas in Communications* 2000; **18**: 535–547.

[9]RusliM, Harris R, Punchihewa A. Markov chain-basedanalytical model of opportunistic routing protocolfor wireless sensor networks, In *TENCON 2010 -2010 IEEE Region 10 Conference*, November 2010;257–262.

[10] A.H. Weerts, J. Schellekens, and F.S. Weiland, "Real-TimeGeospatial Data Handling and Forecasting: Examples fromDelft-FEWS Forecasting Platform/System," IEEE J. Selected Topicsin Applied Earth Observations and Remote Sensing, vol. 3, no. 3,pp. 386-394, Sept. 2010.

[11] A. Diouf and E.F. Lambini, "Monitoring Land-Cover Changes in Semi-Arid Regions: Remote Sensing Data and Field Observationsin the Ferlo, Senegal," J. Arid Environments, vol. 48, pp. 129-148,2001.

[12] A.J. Peters, E.A. WalterShea, L. Ji, A. Vin˜ a, M. Hayes, and M.D.Svoboda, "Drought Monitoring with NDVI-Based StandardizedVegetation Index," Photogrammetric Eng. and Remote Sensing,vol. 68, pp. 71-75, 2002.

[13] C. Gouvia, R.M. Trigo, and C.C. DaCamara, "Drought andVegetation Stress Monitoring in Portugal Using Satellite Data,"Natural Hazards and Earth System Sciences, vol. 9, pp. 185-195, 2009.

[14] J.D. Bolten, W.T. Crow, X. Zhan, T.J. Jackson, and C.A. Reynolds, "Evaluating the Utility of Remotely Sensed Soil MoistureRetrievals for Operational Agricultural Drought Monitoring,"IEEE J. Selected Topics in Applied Earth Observations and RemoteSensing, vol. 3, no. 1, pp. 57-66, Mar. 2010.

[15] C.M. Rulinda, A. Dilo, W. Bijker, and A. Steina, "Characterisingand Quantifying Vegetative Drought in East Africa Using FuzzyModelling and NDVI Data," J. Arid Environments, vol. 78, pp. 169-178, 2012