

## Automonitoring System for Plants using Embedded System & Wireless Sensor Network

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**Abstract**—Automonitoring system is a system which control and monitor all environmental conditions without any man power to control the system .However, as most of the control and monitor system for the growing environments have been materialised as systems control via the conventional wired communication or manually for the relatively wide greenhouses, they are not suitable to apply to environment of remote areas such as places where the cultivation areas to be narrow or the mountainous regions due to difficulties in the installation & maintenance of the system. To overcome this problem wireless sensor is used which is easily produce the crop even in narrow environment. Zigbee which is manually controls network & send to the controller return by getting this continues information .By getting the information parameter we can take immediate action & modified it. By using this process getting maximum growth of plant as well as yield .Wireless sensor having small size so we can easily handle .So in this paper we can see how to install & how to use these system in a growing environment by using wireless sensor & embedded system.Smart farming is a system which is more consentient & easier even in a small place, also we discuss the irrigation management using wireless sensor.

**Keywords**-WSN ,embedded system,Zigbee.

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### I. INTRODUCTION

The exponential growth of human population & even greater demand to grow more better quality food using fewer resources such as land, energy, water fertilizer & pest control. We have expressed a lot of interest in a Smart farming by using wireless sensor & embedded system .Growing plant is art & science. About 95% of plants, food or cash crops are grown in open system. All farmers know how to grow plant naturally but some region environment are not suitable for growth plants. So there is less amount of crop yield .For that Science technology developed method for growing plants. It is high amount of crop yield. By continuously provide suitable environment which required for plant crops.

Smart farming systems are expected to play an important role in improving farming activities. During the past years, sophisticated farm management systems have emerged to replace outdated complex and monolithic farm systems and software tools. The latest trend is to enable these management systems to operate over the Internet. However, the Internet, in its current operation form, faces a number of shortcomings especially in handling vast numbers of networked devices (i.e., Internet of Things) or allowing a simplified integration of systems and services developed by different players. Currently, a number of research initiatives aim at addressing

these shortcomings. Such an example is the “Future Internet” program launched by the European Commission. In the context of our work, we have specified a farm management system that takes advantage of the new characteristics that “Future Internet” offers. These come in terms of generic software modules that can be used to build farming related specialized modules. We present the functional architecture of this farm management system and provide an operational example. We also analyze the technological enablers that will make this architecture a reality. B.V. Elsevier 2012. All rights reserved.

Present solution that distant monitoring & control greenhouse system via internet.It has web based distant monitoring uses high PIC microcontroller base developer board with Ethernet adapter that will allow to It is also use to protect plant from a harmful climate like that more cold , radiation as well as insect & monitor & control the laboratory from any internet connection. This solution after video system from green house camera & allow monitoring growth of plant. In this paper Section II explains Embedded System, Section III explains Zigbee Network Section IV explains Smart Farming and Section gives the working of WSN.

## II. EMBEDDED SYSTEM

Embedded system is a computer system design to perform only one or more specific functions. Specifically, an embedded system means a system with a processor, memories, and input/output integrated with software to control that hardware to perform specific objectives. Generally, it consists of a microprocessor and ROM containing software and running the application software to perform specific objectives once powered.

Embedded systems are departing from old role computers which are responsible for analogical calculations with hardware-oriented interfaces. They are mounted on any product or solution for human-oriented cognitive information. Zigbee network processing and growing as the center of the future industry, but there is no separate legal definition. From structural development of software to enable specific functions and mount on the hardware (microprocessor), it can be classified into software development and embedded system application product development.[1]

## III. ZIGBEE NETWORK

Zigbee wireless communication is a system for collecting sensing data from the surrounding environment and objects from multiple numbers of small sensor nodes installed in a specific area or space and implementing for application services. A wireless sensor network is differentiated from existing networks focused on reciprocal information transfer by automated information collection.[2]

Recently, with the rapid advancement of telecommunication technology and microprocessors, it has now surpassed the limits of traditional sensors with one simple sensory function, and now smart sensor development is possible, containing both wireless communication functions and computing functions, and realizing the ubiquitous sensor network implementation which acknowledges the surrounding environment and performs necessary responding actions on behalf of humans as smart devices. Wireless sensor network technology will be the core technology in the approaching ubiquitous computing era and can be applied for various areas including medical, military, home networks, smart offices, ecosystem watches, smart street lights. ZigBee wireless communication means a technology for wireless sensing and controlling of the surrounding temperature, lights, acceleration, magnetic fields from very small independent wireless sensors installed in physical spaces such as in buildings, roads, clothes, and human bodies. Fig 1 is a sensor network connection structure.

In this wireless sensor network, sensor controller circuit CPU, wireless communication modules, antenna, and power are installed and collect the data using Ad-hoc communication methods and pass it to the collecting node.[3]

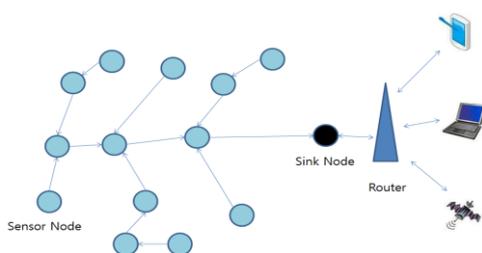


Fig1. Basic configuration of sensor node

## IV. SMART FARMING

### A. Agriculture Field Monitoring

Instead of observing the productivity and quality of farming all the time, this paper proposes the design to monitor the same attributes using a wireless sensor network. For the growth, quality, and productivity of crops in agriculture, temperature, humidity, and carbon dioxide levels are the most important climatic parameters. Moreover, when a critical change in one of the measurements occurs, the farmer will be acknowledged via SMS and e-mail by an agriculture expert.[3]

### B. Environment Monitoring System

There are various problems in traditional agriculture, such as weak real-time data acquisition, limitations in monitoring area, excessive manpower, etc. The system collects various climatic parameters like temperature, humidity, illumination, voltage, etc. from a greenhouse and from there it transmits the data to the nearest server via GPRS. The system includes a web application which is using Google Maps to show the greenhouse status and provide regular voice and SMS alarm services. Since it requires lots of power, it is powered by solar and storage batteries. This results in a low power system with better scalability and can provide better service[4].

### C. Extending Automation to the Farm

Automation can be used to reduce the amount of manual labor and make farming precise, also leading to more agricultural growth. Number of operations on a farm can be automated, like irrigation systems, temperature-controlled systems for livestock, and farm products.[4] In this work, they implemented an automatic lighting system, automatic sprinkler system, house temperature control, and security in farm houses. The system is energy efficient because temperature and motion-sensitive devices will work only when required. An energy-efficient system is an important factor for an agro-based economy. [5]

### D. Development of Precision Agriculture System

In this system, temperature and moisture sensors are deployed at suitable locations to monitor the crop. The sensing system uses a feedback control mechanism with a control unit which controls the flow of water depending on temperature and moisture values. The control unit collects data from sensors, analyzes it, and takes action. [6]

### E. Integrated Wireless Sensor Network for Smart Sesame Farming

Various parts of the ranch are mechanized, which incorporate auto-watering systems, cycles, and secure temperature-controlled walls in areas for domesticated animals and homestead items. In our paper, we actualize a programmed lighting framework, auto-sprinkler framework, in-house temperature control, and security for ranch houses. As temperature and movement touchy gadgets will just work when needed, such a framework rations vitality successfully. The paper likewise shows elements to improve the security of the homestead. Vitality-effective ranch automation is the need of great importance in an agro-based economy. [7]

#### F. Irrigation Control by using WSN

Paper elaborates the application of WSN for Wireless Controlled and monitoring irrigation solution. The implemented irrigation method removes the somewhat need of farmer for flooding irrigation. In agricultural cropping system the efficient water management important factor. [8]

#### G. Remote Wireless Automation and Monitoring of Large Farm

Application describes Designing and programming the controller to monitor and control the network using LabView Software. It shows changes in values of farm as well as real values required for controlling sensing sectors. RF link is built to connect farmer's house and the sensing and control unit. Controller sends signal to farmer's house from 10 KM.[9]

#### H. WSN for precision horticulture

By using the precision agricultural instruments of SDI-12 standards which is used in precision horticulture by the design of new Wireless Sensor node (GAIA SoilMote). Using the IEEE 802.15.4 standard wireless communication can be achieved with a transceiver complaint. The Software which is used for GAIA SoilMote is TinyOS based. There are two methodologies was devised to validate the sensor node design. The phase one consists of laboratory validation of the hardware and software which proposed for the system and also including a study of power consumption and autonomy. The type of application which is chosen has a large potential in market for farming sector and especially the development of PA(Precision Agriculture) applications.[10]

#### I. Wireless Application of Drip Irrigation Automation

The crucial problem which is faced in agricultural areas is the irrigation by fresh water resources. The high demand of freshwater is highly increased, the optimal use of water resources has been provided by automation technology at a greater extent and its apparatus such as solar power sensors, remote control and drip irrigation. There are difficulties on measuring & control systems over large geographical areas. The traditional instrumentations are based on discrete and connected network solution. The system was applied for drip irrigation of dwarf cherry trees on an area of 8 acres in the venue which is located in Central Anatolia. [11]

#### J. Drip Irrigation System & Monitoring Of Soil Wirelessly

In past some years the agricultural technology has immediate growth. The utilization of proper method for irrigation by drip is very proficient and reasonable. The approach reviews various monitoring system and also proposes an automatic monitoring system model which is using Wireless Sensor Network (WSN) which is useful for the farmers to improve the growth of crops. In this method the test of soil for chemical constituents, salinity, fertilizer & water contents and all these data is collected wireless nodes and further processed for the improvement in drip irrigation plan. [12]

### V. HOW WSN WORKS?

We are going to implement the Wireless Sensor Network or Zigbee Network with the help of XBee devices. There are 3 main parts in Zigbee network. Please refer the Fig. 1 for more details. Sensing nodes or End devices are embedded with the

various sensors like CO<sub>2</sub>, Temperature and Humidity. Sensor Nodes will perceive the environment values and forward to routers. Routers will collect values from various sensing nodes and forward to co-coordinator. Finally coordinator will collect values from all routers by regular interval. Coordinator is connected to a device which will be Internet enabled. All the collected values from various sensing nodes will be dumped in to database for processing.

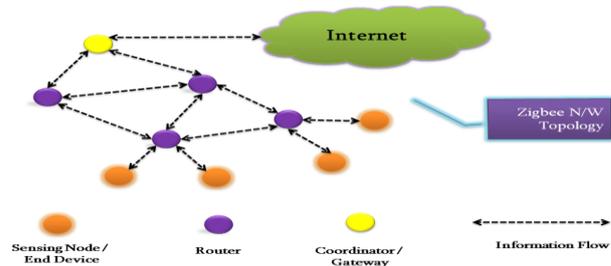


Fig.2 Zigbee Network Topology

### VI. Advantages & Application

1. It requires number operating system for this hardware which result in reduction of cost and portability..
2. The data collection, monitoring & material application to the crops allows for higher yields and lower cost, with less impact to the environment.
3. Low power consumption and easy to install.
4. Intelligent agricultural and environmental sensing is the most important application.
5. It has been instrumented a field with sensor nodes equipped with sensor for measuring air temperature, relative humidity and soil moisture.

### VII. FUTURESCOPE

The future scope of this presentation is it can also be designed to detect the particular disease on the plant and suggest the proper curative on it . In the same way on can predict the whether if the system is made to communicate with the nearer station though satellite communication.

Making use of non-conventional resources like the wind power, solar panel (12V, 15-18W) which can effectively power the GSM module and can be used as a backup towards the end of the day. 2. Intruder alarm or buzzer can be used so that any human/animal intruder cannot disrupt the productivity of the farm. 3. A camera can be installed to monitor the live farm in real time system. 4. A study based on removal of excess rain water can be implemented as well[13]

### VII. ACKNOWLEDEMENT

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### VIII. CONCLUSION

• This automonitoring system is to collect smart farming data periodically in order for user to maintain environment status of various platforms and to improve the quality of produce and increase the productivity.

• To alert the risk audio usually to the user for his speed confrontation with such a risk through the buzzer .we can measure the environmental parameter by using wireless sensor .

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