Prototype of Agricultural Monitoring System Using IOT

Shuruthi N[1], Dr T.Ganesan[2]
[1, 2] Dept of Computer science and Engineering
[1, 2] E.G.S Pillay Engineering College, Nagapattinam, India

Abstract- *A smart irrigation monitoring system. Focus area will be parameters such as temperature and soil moisture. This system will be a substitute to traditional farming method .We will develop such a system that will help a farmer to know his field status in his home or he may be residing in any part of the world. It proposes a automatic irrigation system for the agricultural lands. Currently the automation is one of the important roles in the human life. It not only provides comfort but also reduce energy, efficiency and time saving. Now the industries are use automation and control machine which is high in cost and not suitable for using in a farm field. So here it also designs a smart irrigation technology in low cost which is usable by Indian farmers. An automated irrigation system was developed to optimize water use for agricultural crops. Automation allows us to control appliances automatically. The objectives of this paper were to control the water motor automatically, monitor the temperature level using webcam and we can also watch live streaming of farm on android mobiles.*

Keywords- Soil moisture sensor, Temperature sensor, Humidity, highly mounted cameras.

I. INTRODUCTION

Rice is one of the most important food crops around the world, although its planting area is less than 30% of the total area of grain crops, and the yield is close to 40% of the total grain output. Rice is the grain crop that needs more water. It is pivotal to control the water level accurately according to the water requirements rule of rice in different stages, and it can also greatly reduce the waste of water resource, irrigation costs, and make the cultivation in paddy field more scientific. In recent years, because of hysteresis quality and lack of accuracy, environmental factors such as soil irrigation and illumination intensity cannot get timely and scientific management, which can lead to obstruction to the growth of rice and makes diseases and pests more and more serious. Therefore, acquisition and timely delivery of the information of paddy field have become a basic link to ensure the quality of rice growing environment. The research of fast-acquisition technique of paddy field data is an effective way to improve the precision of agriculture. How to collect and transmit these data accurately and rapidly is an important topic in the field of agricultural production.

Irrigation is the artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and re-vegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Additionally, irrigation also has a few other uses in crop production, which include protecting plants against frost, suppressing weed growth in grain fields and preventing soil consolidation. In contrast, agriculture that relies only on direct rainfall is referred to as rain-fed or farming. Irrigation systems are also used for dust suppression, disposal of sewage, and in mining. Irrigation is often studied together with drainage, which is the natural or artificial removal of surface and sub-surface water from a given area which makes the proposed system more advantageous to the farmer in the future.

II. RELATED WORK

A Wireless Sensor Network (WSN) of spatially distributed autonomous sensors to monitor physical or environmental conditions such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on.

The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting. A sensor node might vary in Size from that of a shoebox down to the size of a grain of dust, although functioning "motes" of genuine microscopic dimensions have yet to be created. The cost of sensor nodes is

similarly variable, ranging from a few to hundreds of dollars, depending on the complexity of the individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth. The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network. The propagation technique between the hops of the network can be routing or flooding.

Sensors Incorporated

The sensors used here is Climatologically Sensor. Sensor is a device that detects and responds to some type of input from the physical environment. The specific input could be heat, motion, moisture, pressure, or any one of a great number of other environmental phenomena. The output is generally a signal that is converted to human-readable display at the sensor location or transmitted electronically over a network for reading or further processing. Climatologically sensor is used to monitor the climate of land environment and the moisturizing sensor is used to monitor the moisture of the crops in the land field.

Agriculture is considered as the basis of life for the human species as it is the main source of food grains and other raw materials. It plays vital role in the growth of country's economy. It also provides large ample employment opportunities to the people. Growth in agricultural sector is necessary for the development of economic condition of the country. Unfortunately, many farmers still use the traditional methods of farming which results in low yielding of crops and fruits. But wherever automation had been implemented and human beings had been replaced by automatic machineries, the yield has been improved. Hence there is need to implement modern science and technology in the agriculture sector for increasing the yield. Most of the papers signifies the use of wireless sensor network which collects the data from different types of sensors and then send it to main server using wireless protocol. The collected data provides the information about different environmental factors which in turns helps to monitor the system. Monitoring environmental factors is not enough and complete solution to improve the yield of the crops. There are number of other factors that affect the productivity to great extent. These factors include attack of insects and pests which can be controlled by spraying the crop with proper insecticide and pesticides. Secondly, attack of wild animals and birds when the crop grows up. There is also possibility of thefts when crop is at the stage of harvesting. Even after harvesting, farmers also face problems in storage of harvested crop. So, in order to provide solutions to all such problems, it is necessary to develop integrated system which will take care of all factors affecting the productivity in every stages like; cultivation, harvesting and post harvesting storage. A system which is useful in monitoring the field data as well as controlling the field operations which provides the flexibility. The aims at making agriculture smart using automation and IOT technologies.

III. METHODOLOGY

Climatologically Sensors are placed in the field for irrigation monitoring. The sensors are connected to the controller where controller is operated at crystal oscillator generated frequency. Camera trap is a hand held device used to take pictures of crop field and periodic camera trapped pictures are sent over to the land owners and server. Most of the farm land irrigation techniques require manual intervention. This automated technology is to reduce the human intervention in the farm land. In proposed system, Humidity and Temperature sensor is used to find out the environmental condition. Where microcontroller read the value and programmed with controller to control the system based on the environmental condition. Here we use Internet of Things technology by which particular plant variety is selected based on the plant's unique ID to select which plant are using in the farm land and day by day processes information will update to the web server . Here camera is used to surveying the farm land and growth of the particular plant. If the plant is affect by any disease then immediately alert message is sent to the farmer.
The Readings from different sensors are collected and send to micro controller. It stores collected data in the database and analyzes the stored data. The readings are displayed on PC using WIFI connection. Thus an irrigation system which controls the flow as per the requirement along with automation. With the use of low cost sensors and the simple circuitry makes these instrument a low cost product, which can be bought even by a poor farmer.

I. Rain gun sensor can be added so that when it rains there won't be floods. Rain water harvesting can be done and this harvested water can be used to irrigate fields.
II. Hooters can be used so that it gives warning at various occasions such as floods etc. Using rain sensors .They can include many more water quality sensors that affect the crops.

Condition	Soil Moisture	Water level	Motor Status
1	DRY	FULL	ON
2	WET	FULL	OFF
3	DRY	MEDIUM	ON
4	WET	MEDIUM	OFF
5	DRY	LOW	ON
6	WET	LOW	OFF
7	DRY	NULL	OFF
8	WET	NULL	OFF

Table1: Different conditions for irrigation system operation

IV. SYSTEM MODEL

The Master Control Chip the master control chip presented in the node is PIC based on, it is widely used in the application of embedded system because of its high-performance, low cost and low power consumption. The working frequency is 20MHz, and there are built-in high speed memory, 512K bytes of flash memory and 64 bytes of SRAM, abundant enhanced I/O ports and peripherals connected to two APB buses, three 8-bit ADC modules, and two general-purpose 16-bit timers. In addition, there are also standard and advanced communication interfaces, two I2C buses, three SPIs, two I2Ss, one SDIO, five USARTs, one USB and one CAN.

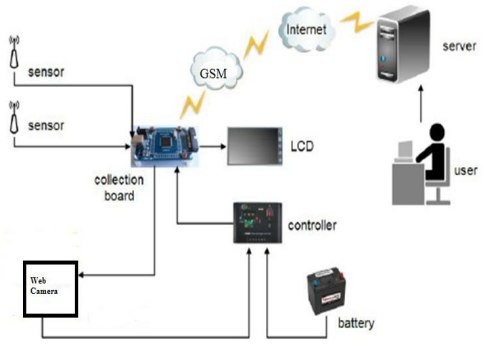

Fig. 1. System requirements

There are four types of sensors in this node: temperature, soil moisture content, humidity value, and illumination intensity.

LM35 temperature sensor adopts the unique single-wire interface mode, when it is connected to microprocessor, there is only one single-wire architrave to realize both-way communication between microprocessor and LM35 temperature sensor; two light intensity sensors are hooked up to the same I2C bus, they read data in turn circularly, and decide the direction of solar panel to rotate to according to the data gathered from both of the two sensors; the data gathered from soil humidity sensor, water level sensor and pH sensor are analogue data, they are collected through the ADC1 module and the results are saved in an array, according to the difference of their physical storage addresses to perform functions respectively and obtain the more accurate numerical values after processing.

GSM Module

We use wireless communication mode of GSM network to realize the data transmission in this node. GSM service provides point-to-point PPP link, which adopts the wireless IP technology based on packet transfer mode and supports TCP/IP protocol and X.25 protocol, and it is accessed to Internet through GSM network. The initialization of status and frequency of wireless module is required before the dial-up. GSM covers a wide range of area and billing according to the flow, and there are just a few seconds spent to build a new wireless connection, and the network connection can be carried out at any time. Because of these advantages, we employ SIM900A module in this design, after the node is powered up every time, to begin with, the module sends AT commands through serial port to initial SIM900A module and be ready for data transmission, and then it sends data and AT instructions through the serial port to the display interface of server. To solve the problem of changing IP address, the dynamic domain name login method is presented in this design

Automatic Tracking Solar Power Supply System

To maximize the efficiency of solar energy conversion, the function of automatic tracking of solar panel is presented in this design. Generally, the methods of fixed time assay and coordinates have been widely used which have been implemented to realize the tracking. The advantage of fixed time assay is simple circuit, and the disadvantage is the different times of sunrise and sunset in different seasons. On this occasion, the accuracy of node adjustment may reduce; the advantage of coordinate method is the higher accuracy of adjustment for system, but the circuit is too complex.

Based on the discussion above, automatic tracking method of solar panels based on numerical comparison of light intensity is presented in this design. Compared with placing the two light sensors in parallel on the lower end of solar cell panel (as shown in Fig.), it can make greater numerical difference between the two light sensors to put them together at a certain angle in the same position on the lower end of solar cell panel (as shown in Fig.), so solar cell panel is more sensitive to the change of solar altitude. When sunlight

irradiates vertically on the surface of solar cell panel, if the numerical difference of the data received from the two light intensity sensors is very small, the motor does not rotate. When angle between the direction of sunlight and vertical direction of battery plate becomes larger, gap between the data received from two light intensity sensors can gradually be widened. When the gap is more than 100 Lux, according to the data received from two light intensity sensors, the rotation direction of solar panel can be determined, and it will drive the motor to rotate until the gap of data is less than 100 Lux. Therefore, the control is more accurate and the circuit is relatively easy to be achieved.

V. CONCLUSION

The Soil moisture content based irrigation system was developed and successfully implemented along with flow sensor. Salient features of the system are: Closed loop automatic irrigation system, temperature and water usage monitoring. User can easily preset the levels of the Moisture and is regularly updated about current value of all Parameters on LCD display. Here camera is used to surveying the farm land and growth of the particular plant. If the plant is affect by any disease then immediately alert message is sent to the farmer.

REFERENCES

[1] EA Chiaradia, A. Facchi, D. Masseroni and D. Ferrari, "An integrated, multisensor system for the continuous monitoring of water dynamics in rice fields under different irrigation regimes". *Environmental Monitoring and Assessment*, vol. 187, no. 9, pp. 586-603, Sep. 2015

[2] H. Luo, G. Li and W. Peng, "Real-time remote monitoring system for aquaculture water quality". *International Journal of Agricultural &Biological Engineering*, vol. 8, no. 16, pp. 136-143, Dec. 2015

[3] I. Heimann, V. B. Bright and M. W. Mcleod, "Source attribution of air pollution by spatial scale separation using high spatial density networks of low cost air quality sensors". *Atmospheric Environment*, vol. 113, no. 11, pp. 10-19, Jul. 2015

[4] L. Ranghetti, L. Busetto, A Crema, "Testing estimation of water surface in Italian rice jdistrict from MODIS satellite data". *International Journal of Applied Earth Observation & Geo information*, vol. 52, no.7, pp.284-295, Oct. 2016

[5] M. Campos-Taberner , F. J. García-Haro and R. Confalonieri, "Multitemporal Monitoring of Plant Area Index in the Valencia Rice District with Pocket LAI". *Remote Sensing*, vol. 8, no. 3, pp. 192-209, Mar. 2016