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IoT Based Smart Agriculture Field Monitoring and Insect Killer System

C. Rajeshkannan1, P. Naveen Kumar2

[1]PG Student, Embedded System Technologies, Knowledge Institute of Technology, Salem, Tamil Nadu, India

[2]Assistant Professor, Department of EEE, Knowledge Institute of Technology, Salem, Tamil Nadu, India

ABSTRACT

As a part of agriculture-based citizen, it is our duty to create a beneficial system in which the poor and needy people should not suffer from starvation. Simultaneously the producer also gets benefit by their products both economically as well as through social activities. This thought provokes every person to satisfy and bring solution for those who are in need of it. Different soil sensors are utilized to gauge temperature, moisture, nutrition (Nitrogen(N)-Phosphorus(P)-Potassium(K)) ,dampness and light, stickiness and pH esteem. The data from the sensors in the dirt is shipped off the PIC16f877a A/D converter then from A/D converter it ship off the cloud through Nodemcu. At last we can see the data spared to cloud on cell phone just as PC. Based on data we realize which yield is reasonable with given soil boundary. Fly insect killer machine assists to attract flying insects towards a system that works on decoy principle. The electronic insect killer light has been fitted with high voltage wires near tube-light which instantly kill insects. In order to differentiate good and bad insects and also for surveillance, here we implemented video monitoring system using Raspberry pi and camera. In addition to that remote control is added to activate or deactivate the killer machine.

KEYWORDS: NODEMCU, Temperature sensor, NPK sensor, Water level Sensor, GSM

I. INTRODUCTION

Agriculture is the basic need of every human in this world. India is an agriculturally based country 70% of the Indians are either directly or indirectly involved in agricultural works. Indian economy depends on the production of agricultural products. The growing countries like India occupied with large population with insufficient food supply and food production. This is due to various factors like urbanization, colonization and industrialization. The people started moving towards cosmopolitan cities besides their native villages. This causes the poor improvement of Agricultural and farming Technologies. Failures of monsoon, unavailability of water, improvement of concrete jungles are the major factors that act as desolation of cultivable lands.

A farmer can sustain only with a basic requirement of proper monsoon, viable seeds and monetary benefits from the resources to achieve his goals. These factors are not periodically provided to the farmers so they may suffer with unavailability of recourses. A farmer can achieve their goals only when the basic amenities of proper irrigation, availability of manure and the

condition of the soil are obtained. When they face challenges against these basic amenities will affect not only the farmers but also affects the society. The production will be inadequate against the expectation of population. If any deficient in the production of food grains will directly slaughter down the growing population. As a citizen of India, it is our duty to give remedies for the farmers in making healthy crop with high yielding varieties. With this instinct project have been designed which will give the solution to rectify the deficiency such as moisture, nutrient, water level, humidity and temperature which are integrated with IoT. By experiencing the inadequate availability of food, observation of below poverty line people struggles for existence. The livelihood difficulties of the poor people those who are suffering to get their basic amenities. The technical graduate develops the awareness and motivates to do project against the problem faced by a farmer. The statistical report says that 80% of the population of our nation is under poverty line and their annual income is unsatisfying to fulfill their basic amenities like food, cloth and shelter. If a person gets at least one meal a day without any struggle that will make a nation strong and versatile. Based on this agronomy everyone must involve in improving the production of food crops against the unnatural happenings in the environment. The environmental factors affect the production of food crops and it should not kill the people those who are unbearable. Hence the food crops must stay with long duration and it should be energetic in nature. It should also saturate the needs of the people.

II. LITERATURE SURVEY

Kumar [1] proposed to increase high yielding varieties and to improve same type of crops cultivated in a specific soil. The selection may be clone, mask or pure line. One of the best methods is pure line selection. This method helps to develop a particular type of plant by the certain parameter are observed. They are soil colour (red soil, clay soil, alluvial soil, loamy and black soil), pH of the soil (acidic or base) and temperature. A particular plant requires a specific type of soil, pH and temperature. So, these parameters can promote the growth of high yielding crops by selecting a suitable crop.

Vijayalaksmi[2] have mentioned that during the growth of the plant there may be a chance for cause of pest based on the plants. This can be detected manually or using database method. Physical detection of pest affection is a tedious job and it consumes lots of energy and time. This will lead to loss of grains if the physical observation is not done in a proper time. To avoid this, if a pheasant adopts a database come a sensor to detect the pest affected plant will reduce a loss of grains. Whenever any conflict in temperature and humidity values required by the plant exceeds, the plant undergoes the effect of pest. Due to the act of pest chlorosis and sometimes necrosis may occur in the plants. Some of the plants indicate the deficiency of chlorophyll content by decolorization against its normal condition. This decolorization or the chlorosis appearance is detected by the sensor and it compared automatically with the normal healthy plant database with the help of Raspberry Pi. The abnormality or the difference between the affected and healthy plant data will be compared with the Raspberry Pi and the difference indicated periodically to the crop developer by GSM module.

El-magrous et al [3] proposed that farmers can grow healthy and high yielding plant with the help of global concern. Global concern acts as a guide liner to the farmer. A well-established database weather station is centrally situated and it has articulated of local substations (weather data station). The local station and the central station are always linked together and it reciprocally exchanges its data through cloud and gives benefit to the farmers. The central weather station which has a standard data about the moisture, temperature and availability of

water (irrigation types) are enlisted within it. The local weather stations also have specific areas (endemic) of data about that particular area.

Fiona & Anitha[4] proposed that in crop cultivation selection of crop is an important factor. It can be done either manually or automatically. In manual process there is a chance of misconception of the characters of the plants and there will be defect in selection. Here comparison of plants is not considered and the criteria are physically tested. In this process we can get pure line breeding and internal characters are not analysed. Comparative accounts of internal characters are neglected. This will produce breeding and cannot expect the required yield. In automated detection of crop the original plant characters along with external and internal features are fed in the device. This will manipulate the selection of crop according to the environment by having the criteria are already fed in the device. The selection of plants is done with a comparative parameter with the healthy and normal plants image in the automated plant detection device. Because of this the complete internal and external character are analysed with image processing technique. Hence pure line breeding and healthy plant development for higher yield is obtained.

Richard Charles Andrew & Reza Malekian[5] proposed that as technology developed in various fields and it is implemented in the betterment of different class people. IoT is taken up in consideration with precision farming. In agronomy advanced technologies are implemented to develop the production of crops. Though the advanced agronomy is followed there is a defect and loss of production in crops. To saturate this deficiency technology sensors are used to rectify the shortcomings in the system. Sensors are used in different sectors such as irrigation and controlling of temperature will enhance the growth of the plant, supply adequate level of temperature and feed water whenever required by the crop. If moisture content in the soil undergoes changes that can be rectified by a specific sensor under IoT system and it is immediately solved by entering the moisture content. The irrigation process, soil moisture and temperature for the plant are well maintained. This promotes the growth of a plant so that farmers will get benefited and their physical presence is also avoided with the help of IoT.

Pawar & Chillarge[6] have mentioned that farmer have to adopt algorithm data for the betterment of crop production. A standard data is recorded on every individual local area. The data dealt about the toxicity and pH of the soil. A comparison account is taken on the crop which is to be cultivated in a particular area to find out the toxicity and pH of that confined soil. The above data will alert the farmer about the condition of the soil and indicates the specificity of crop to be in that field. By this method the soil fertility is detected by experimenting the pH value and the toxicity of the soil. It creates the awareness to the farmers on deficiency or surplus amount of toxic nutrients present in the field. Hence the farmer gets benefit either to remove the toxicity from the soil or to improve the pH value of the soil. This will enhance the growth of the plant and yield.

III. EXISTING SYSTEM

Agriculture is the vital resource of our nation. Crops are grown and plants can be cultivated in a suitable environment according to their nature. Farmers can grow healthy and high yielding plant with the help of global concern. In advanced agronomy IoT are introduced to develop a healthy crop in a particular area without loss of a single grain. As per the literature survey the system consists of few methodologies to make precision farming such as continuous monitoring of soil moisture, temperature and sensor data will be given to the farmer's knowledge. During the growth of the plant there may be a chance for cause of pest based on the plants. There is a system to control the over usage of

fertilizer and chemical pesticides which leads to the poor yield and cause loss to the farmers.

IV. PROPOSED SYSTEM

The project consists of system that will readily give the preference to crops for cultivation, rather than going to agriculture department. When a crop is cultivated in the field it requires periodic irrigation, production of the crops and the humidity of the soil. It consists of set of integrated sensors which will give the data about all the soil parameters which is in necessity to produce high yield. The serious problem that a farmer faces is the unpredictable amount of fertilizers required to feed to the crop. The installed NPK (nitrogen, phosphorous, potassium) system will give the information about the NPK nutrients value at all time.

Distribute the water to every plant equally by calculating water availability automatically and also using surveillance camera to monitor garden from animal entry and harmful insects like locus. If any abnormal things happen then intimation goes to farmer through SMS. The proposed system will reduce the use of chemical pesticides and promotes the growth of crops as organic and prevents air pollution and also it is useful for entire garden surveillance.

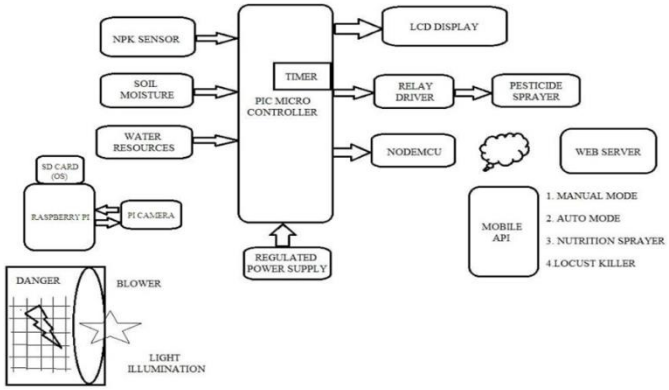

Figure 1.Block Diagram of Proposed System

The block diagram of proposed system is shown in Figure 1. Here what are the hardware used are analyzed and indicated. Totally four sensors such as water level indicator, NPK sensor, temperature sensor and soil moisture sensor are used to know the soil parameters.

The circuit diagram as shown in Figure 2 illustrates the pin connection of every component with the microcontroller. Temperature sensor, soil moisture sensor, water level indicator and NPK sensor are connected to the analogue input pins of microcontroller.

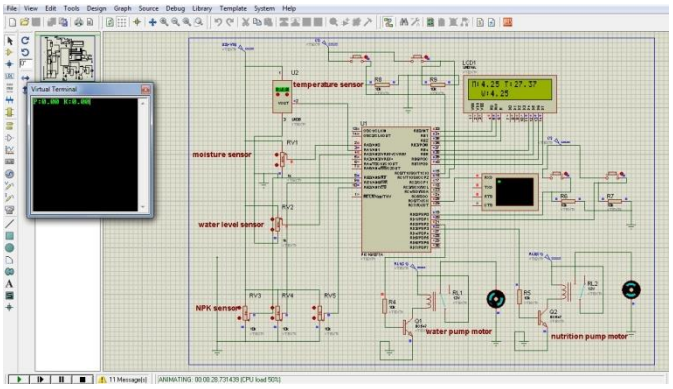

Figure 2. Circuit diagram of proposed system

Therefore totally 6 analogue pins of Microcontroller are used to read value from the sensor. In the same way the output connections of Microcontroller pins are as follows. To display the required output in the LCD, 6 pins digital output pins of Microcontroller from 4 to 9 are connected to the LCD display to activate relay 13 pins of Microcontroller is connected to the relay to turn OFF and ON motor both automatically and manually. The Wi-Fi nodule is connected with the transmitter pin of Microcontroller, since the Wi-Fi nodule has to transmit the entire digital sensor data to the cloud for periodic maintenance. Three pins D0, D1 and D2 are connected with the Microcontroller pin 10, 11and 12 to control the mode in which the Microcontroller should act. Totally three mode are to be controlled via Wi- Fi module, hence three pins are activated. The transmitter pin 1 from the Microcontroller is connected to the receiver pin of the GSM module. Therefore totally 13 digital output pins are used to get desired output.

V. SMART FARMING USING IOT

IoT is the latest technology which makes communication between two electronic devices. The data of IoT will be stored in the cloud memory. The information can be sent and receive from cloud at anytime and anywhere with the help of the internet . The internet of things plays a major role in our project. The prototype is designed in such a way that farmers can able to control the ON and OFF of water pump motor and he could be able to monitor the soil nutrient parameters such as nitrogen, phosphorous and potassium, soil moisture content, amount of water present in the storage tank and the surrounding temperature of field. If the farmers can able to see this all features in his hand at anytime and anywhere it would be a great relief for them to achieve high yield and to lower their work stress.

Therefore, to enhance internet connection wi-Fi module (ESP8266) is used. The operating voltage of Wi-Fi module is about 5V. With the help of the Wi-Fi module the internet communication is made between microcontroller controller and web server. To transmit data from microcontroller to web server, the transmitter pin Tx-1 of microcontroller is connected to receiver pin of ESP8266. Once the Wi-Fi module gets the internet connection through mobile hotspot the communication is bridged and data will be transmitted from microcontroller to web server.

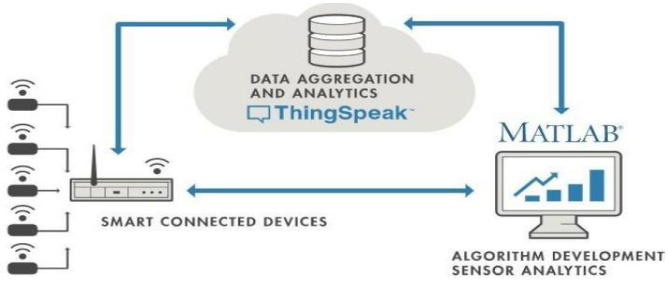

Figure 3. Smart connected devices

- Can connect your hardware to Thing Speak.
- Can access your data base online and offline.
- Can remotely visualized sensor data in real time.

To use IoT web server, ThingSpeak software is selected and used. ThingSpeak is an IoT oriented platform service branch of MathWorks. They are the makers of MATLAB and Simulink. ThingSpeak allow us to calculate, analyze real time data in the cloud storage. ThingSpeak allows immediate view of data transferred by the prototype. IoT provides the communication between the microcontroller and web server which can be viewed through ThingSpeak as shown in Figure 3.

Native libraries are used to send and receive data from cloud storage. ThingSpeak is automatic in nature, which will chart sensor data sent by the controller. The chart will enable us to monitor the equipment from anywhere in real time. Features of smart connected device in farming,

The sensor data will be stored in the web server and according to its value variation the graph will be constructed automatically. The data will be stored for every minute permanently. The stored and research analysis purposes. graphically monitored and controlled by using LabVIEW.

VI. ALGORITHM

Step 1 : Start the process.

Step 2 : Initialize the system.

Step 3 : Representation of the temperature, humidity, nutrient content of soil and according to the measured value it indicates the normal and abnormal conditions.

Step 4 : Representation of the pressure, water level and nutrient content will be displayed in LCD and motor pump will work accordingly.

Step 5 : Stop the process.

6.1 Flow Chart

The flowchart gives us better understanding about the detailed process. It illustrates about the conditions and objective under which the prototype works.

The overview illustrates, water level and soil moisture sensor will work based on the threshold values given in default.

Whenever any change in the threshold values motor which is connected to the sensor will either ON / OFF. The nutrients supply (NPK sensor) will have the threshold value and which regulate the motor ON / OFF when default threshold values varies. All three sensors are interconnected by an micro controller which senses the signals by the Wi-Fi connectivity.

Figure 4. Flow Chart of Proposed System

VII. RESULTS

Hardware Results

It is a device that can be operated either manually or automatically. This kind of dual mode can enhance the productivity of crop and continuity functioning of the device. Due to this type of special arrangement the device can be operated without any interruption. Malfunctioning of the device can be rectified immediately by any one of the alternate methods. The hardware prototype in Figure 4.1 shows the entire working process of agriculture automation. It is a device that can be operated either manually or automatically. This kind of dual mode can enhance the productivity of crop and continuity functioning of the device. Due to this type of special arrangement the device can be operated without any interruption. Malfunctioning of the device can be rectified immediately by any one of the alternate methods. The hardware prototype in Figure 5 shows the entire working process of agriculture automation.

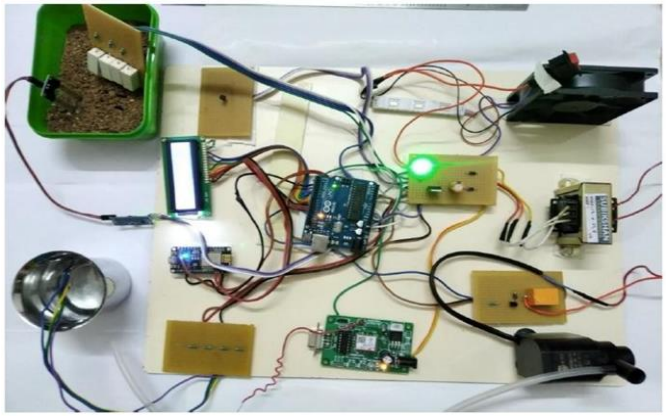

Figure 5. hardware prototype

Figure 6. Sensed Value on Display and intimation

Software Results

The software result is obtained through IoT in web server created in ThingSpeak. The farmer has his own login id and password. The data will periodically and permanently in this web server.

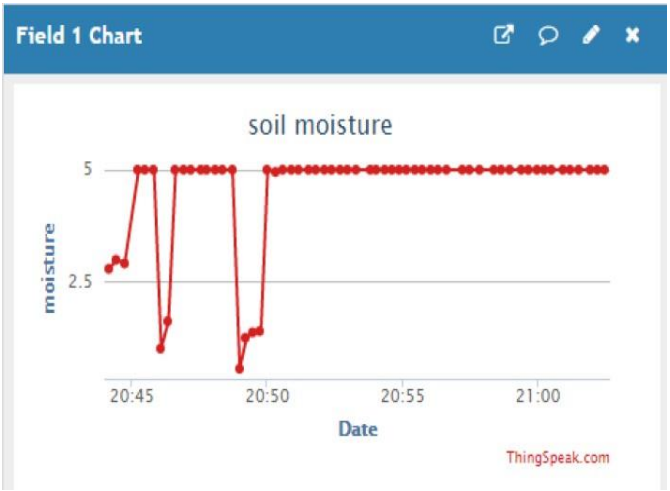

Figure 7. Monitoring moisture sensor data using IoT

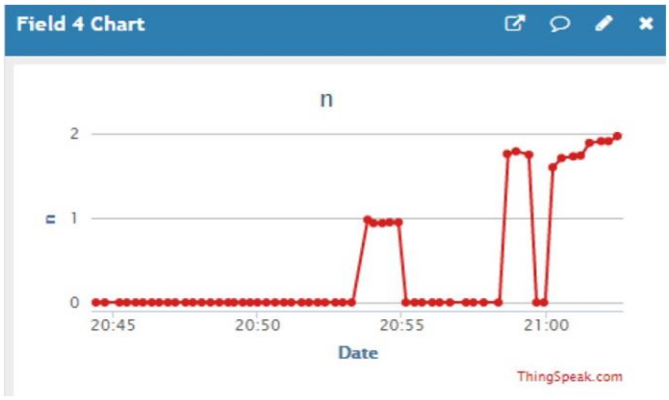

Figure 8.Monitoring NPK sensor data using IoT

SMS Alert System

In this device, if any deficiency of any soil parameters such as Nitrogen, Phosphorous and Potassium as well the soil moisture level, water level in the storage tank occurs should be known to the farmers immediately. The GSM module helps in intimation of alert message to farmers as shown in the Figure.

Figure 9. SMS alert

VIII. CONCLUSION

The current generation farmers are facing several problems in agriculture and they do not get proper guide to proceed. They had been looking forward to technologies to improve their farming quality and quantity. The IoT and data analysis will be very useful to them and influence their agriculture in the positive way to get precise knowledge in soil parameters. Pure line breeding can be done with this method. Wastage of grains is much reduced. The set of integrated sensor technologies help them to get the information about their field in their hands at any time. This would play a vital role in water management, selecting the appropriate crop for cultivation and also to reduce the use of chemical fertilizer and pesticides. It also promotes the economic level of the farmers. The growth of healthy crop can be developed.

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