Diverse IoT Based Gadgets to Update a Moderate Condition of Farmers in India

Akshay Khandelwal[1], Ajay Vikram Singh[2], Sunil Kumar Khatri[3]

[1,2,3]Amity Institute of Information Technology, Amity University, Noida, India
[1]khandelwalakshay95@gmail.com, [2]avsingh1@amity.edu, [3]skkhatri@amity.edu

Abstract: Farming holds an important place in the growth of the nation as It holds a great share in our Indian economy. But if we compare our level of irrigation from other countries we are far away from them till today our agriculture system still relies on the traditional approach as others are using new approach day by day. [1] Hence this project aims to convert the irrigation to smart irrigation by using high technology and the Internet of things. The major characteristics the system is a smart push-button control robot which includes GPS and that will perform a task like removing of unwanted plants from the field(weeding), spraying water to the crop, sensing of moisture and most important scaring of birds and animals, keeping cautiousness and many more. [2] Secondly, it also adds another feature of a water system with shrewd handle and selection making depend on actual realistic farm information. Now, after protecting crops this project also adds a security measure for a warehouse-like- temperature maintenance, theft detection in the warehouse, humidity maintenance in the storeroom. All these tasks are controlled by any computer connected to the net and performed by the camera, zig wave modules, interfacing sensors and actuators with micro-controller and raspberry pi. [3]

Keywords: GPS, Zig Wave, Raspberry pi, Farming, IoT

I. INTRODUCTION

As we are evolving toward the new era and their execution that is very important to mark-up our agriculture sector. Various researchers are doing work in the agriculture sector. Many plans denote implementation of a wireless sensor network that manages information from the sensors and sends to different nodes by using different wireless protocol. The collected information provides data for the different atmospheric aspects. [4] But observing atmospheric aspects is not the only way to increase the productivity of the crops there are others aspects too which should be taken care of. There are aspects which are decreasing the productivity of the crop to a greater extent. Hence the solution of these aspects is to implement automation to increase productivity and this helps to overcome the problem of agriculture. In context to give away to all these hurdles, it is very compulsory to build a system that will see all the reasons that are affecting productivity in each and every part. But fully automation will not be achieved in agriculture due to many reasons. As it is proposed in the investigation level it is not provided to the agriculturists as a form of product to get benefit from these measures. Hence this project takes care about making an agriculture to smart agriculture using IoT and it will be given to agriculturists of our country. However, the technology used in the agriculture sector acts as a vital role in reducing the manpower and increasing the production of crops. Some of the work is done for the growth of agriculturists which gives them the system that uses technology which is very helpful for increasing agriculture growth. The system which is proposed in this paper uses distributed wireless sensor network focuses on exact duration in field sensing, variable rate irrigation, managing of a site particularly on move water structure to increase the growth of crops with not so much consumption of water was built by Y. Kim.

II. LITERATURE REVIEW

The latest case of deploying groundwater level, evaporating natural sources of water, unpredictable weather urges an immediate demand of actual use of irrigation in fields. To cop-up with these conditions of the other countries temp. And moisture sensors at the right location are to be implemented in the fields and various aspects that will help in the growth of productivity in a great way. These sensors can help in attacking of insects and pests which an algorithm is created with values of being managed by spraying of the crop with actual insecticide temperature and soil moisture can be implemented into pesticides. Other aspects are attacking of birds and wild animals. [5] A program is built with variables of dirt moisture and temperature that will install into a microcontroller-based gateway to manage the irrigation. The programmed is energised with photovoltaic panels that set a transmission relationship on both sides to depend on mobile extranet platform that gives permission of examine the information and the plan of irrigation is controlled by a home page. The hi-tech progress in remote sensor systems becomes very conceivable to apply in checking as well as controlling the parameters of greenhouse in irrigation. Thereafter survey in the agriculture sector, the researcher found that the productivity of agriculture is deploying season by season. The system was built by using 5 farms sensor stages which holds an information after that dispatch to the main station by operating GPS where major actions were taken to control the water system on the basis of information stored in the system. The system gives a guarantee cheap internet way as well as

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remote controlling for managing the water supply in the field. In the research related to the wireless sensor network, investigators calculated dirt connected values like humidity and temperature. Sensors were installed under the dirt which connects with the node with the help of transmitting rules giving very low cost and it will increase the time period of dirt inspecting system. The project was built with the help of a microcontroller, UART sensors and interface while the process was done by sampling hour by hour and loading the information, convert it and then examine the message level. The problem with this system is its price and the placing of sensors below the crop that creates weakness of the RF signals.

III. SYSTEM OVERVIEW AND DESIGN

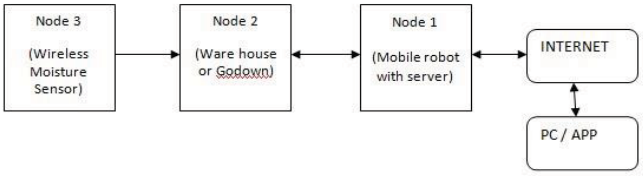

Fig. 1. FRAMEWORK

The project has parts: node1, node2, node3 and computer or any cellular application to handle the system. In this current project, each node is connected with various sensors and appliance and they are connected to a centralized server with the help internet models the host dispatch and collect data from one user to the last user via a wireless connection. There are two methods of operating a system; automatic method and the manual method. In the automatic method system defined solution it manages the pre-defined appliances and in the manual method the operator of the system will manage these tasks performed by the system with the help of a mobile application either by computer commands. [6]

IV. ARCHITECTURE

Node 1: Node 1 has a GPS inbuilt mobile operated robot which can be controlled by the computer using remote and it can be programmed in such a way that it is used to navigate independently within the range of farm using the direction by the GPS system.

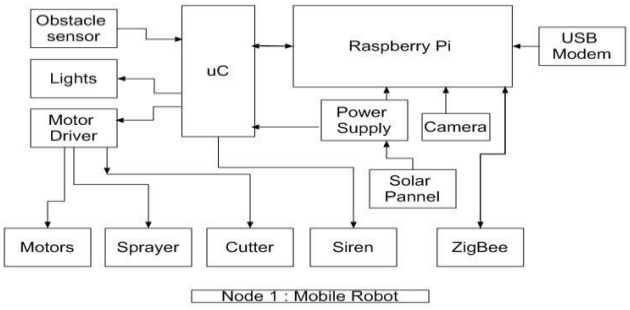

Fig. 2. Node 1

The remote that is controlled by remote has different sensors and appliances such as camera, cutter, alarm, obstacle sensor and they are used to perform a task like-: animal and bird scaring, removing of unwanted plants from the field, keeping vigilance and water spraying.

Node 2: Node 2 will be placed in the storeroom where agriculturist is keeping their crops after cultivating. Node 2 consists of temp. the detector, motion detector, a sensor for light, cooler, heater, humidity sensor they together connect with AVR microcontroller. The motion detector will be placed in the store for detecting motion when safety motion is on active mode will be enabled and if it detects the motion in the room it will send the alert alarm to the user with the help of a Raspberry Pi and by this, the user can identify the theft detection.

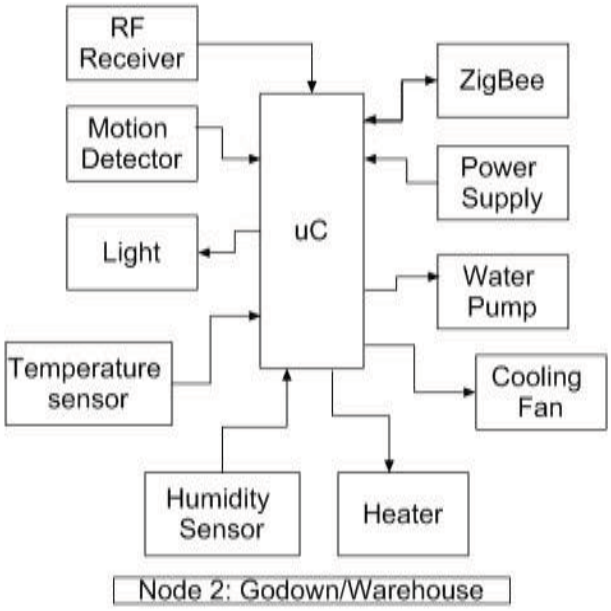

Fig. 3. Node 2

Now, if we talk about the temp. Sensor and the humidity sensor they work simultaneously and if any entity crosses the path then the heater and cooler will be turned ON/OFF by itself by giving temp. And humidity maintainability. Node2 will also take care of water motor by rely upon the dirt moisture information dispatch by a node3.[7]

Node 3: Node3 is an irrigation node with characteristics like -: savvy maintenance of water motor relies upon the real-time farm information i.e. itself turning ON/OFF the motor getting required amount of water in the farmdepends on the dirt moisture level in automatic mode, turning water motor ON/OFF with remote using PC by hand, and constant supervising of dirt moisture.

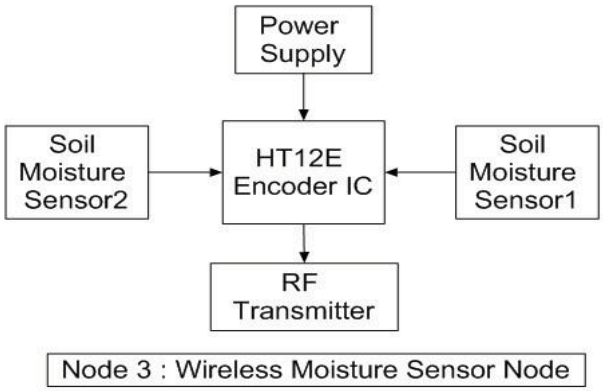

Fig. 4. Node 3

In node 3, the information is transferred by the moisture sensor using HT12E Encoder IC and an RF transmitter. transferred information delivered with node2 and node 3 is transmitted with a microcontroller in respect to maintaining the working of water motor. [8]

A. Equipment's Used

In this venture, there are various types of sensors and microcontrollers that are used that help in converting agriculture to smart agriculture. List of sensors and the program that is used in this venture are discussed below-:

1. **Ultra-sonic sensor-:** It is a gadget that is used to calculate the length of an entity using its sound waves, it uses a transducer to dispatch and collect ultra-sonic pulses that give back the data about the entity proximity. This sensor has very high-frequency waves that we can consider from the edges to create different echo design. This sensor is used to recognize the presence and find out the levels of higher accuracy. This sensor vibrates at a range above the human hearing the ultra-sonic sensor used the transducer to dispatch and collect the ultrasonic sound. The transducer is used to dispatch the pulse and to collect the echo.

2. **Zig Wave Module-:**Zig Wave is implemented for getting wireless communication from node1 and node 2. The length of Zig Wave is about forty metre. and this can be increased by implementing high power modules or by implementing a network of modules. Its utilization rate is very less although Zig Wave is cheaper with respect to others modules like -: Bluetooth and Wi-Fi. Zig Wave is generally used to maintain WAN.

3. **Humidity sensor-:** DHT22 are normal, cheap digital humidity and temperature sensor. It displays the electronic value and in DHT22 the user doesn't have implement conversion algo. At ADC is the microcontroller and thus it sends its outcome straight away to data pin rather than ADC. The capacitive sensor in DHT22 is used for measuring moisture. the drawback of this sensor is that the user will get refreshed information from this sensor after time span of two seconds.

4. **Dirt moisture sensor-:** Dirt moisture sensor calculates the quantity of water in the dirt. It runs on the phenomenon of the electrical resistance of the dirt. This sensor makes the connection among the calculated quality and dirt moisture is marked and it will rely upon the atmospheric aspects such as temp., electric conductivity and dirt type. This sensor is operated to check the water in the farm then send the results to the microcontroller in respect to take over the managing operation of turning water motor On or Off.

5. **Temperature Sensor TMP36-:** TMP36 is correct centigrade temp. sensors. The output voltage of TMP36 is inversely proportionate to the Celsius of temp. In TMP36 there is no use of any outer deduction to give actual temp. range. This sensor is very low ion price. The sensor has very low exit resistance then linear exit. The working temp. scope aimed at TMP36 -50 ˚ to +145 ˚Celsius with the rising in temp., the outer volt. of this sensor rises in a line and the value of voltage is transmitted to the microcontroller which is multiple to convert factor in respect to send the value of exact temp. [9]

6. **Raspberry Pi-:** It is a minor portable pc that is used to do a small task and networking task. Raspberry Pi is the important object on the sector of IoT. It gives the permission to the wireless network and the connection to the automatic system with remote areas managing the device becomes possible. Raspberry Pi software comes in a different version. This paper is using model pi two model b which has random access memory of one gigabyte. Thus, the model also consists of -: four ports for USB, Full HDMI support, forty GPIO pins, Internet port, audio jack of 3.5mm. [10]

A. Program used

1. **AVRStudioVersion4-:** The AVR studio is a software development environment which uses the programmer, editor, simulator etc. the AVR studio has its predefinedC programming compiler which is known as AVR GNU C Compiler (GCC). In AVR studio there is no use to take help from external c compiler. The studio provides the environment to make the program for all the bits and for the AVR series of the microcontroller. The AVR also joins the fully Touch studio. The AVR provides the support for many programmers. [11]

2. **Proteus8Simulator-:** The Proteus simulator suite is a software that is generally used for digital design. This software is generally imposed by engineers and many technicians to create the structure and blueprint for producing printed circuit boards. The simulator is used to

test the results and plant them in edges of the gadgets before the final test. The main advantage of this simulator is that the redesign of the controller program can be done in this Proteus. The equipmentkeeps the statistical gap from danger hardware because of not using right plan. [12]

3. **Plunge trace**-: This software is used for making programs and circuit pieces. The makers include the polyglot GUI and steps wise training in different languages. Plunge trace consists of 4 segments- Schematic Capture Editor, PCB Layout Editor, Component Editor, and Pattern Editor. [13]

4. **Sinaprog-:** It is a Hex downloader app., that consist of AVR Dude & Fuse Bit Calculator. The software is usually needed to copy the programs and the blueprint sinaprog is also used to place the fuse bits of the entire AVR dependent microcontrollers. [14]

5. **Raspbian OS-:** It is a freeware OS which depends on UNIX for the Raspberry Pi hardware. The OS is the collection of all graphs and useful features which used to make Raspberry pi operate in the OS. Moreover, the OS gives the clean OS i.e. it has 35k packages, that are already compiled in the application tie up in an easy format which makes its installation easy on the Raspberry Pi. The 35k packages are adjusted to give the finest outcome on the Raspberry Pi. The software is still under construction with implementing the stable version of more packages as possible. [15]

V. EXPERIMENT

Fig. 5. Setup for Node 1

In the above figure the experiment format for the first node contains the mobile operated robot which is having only one server, GPS, camera and sensors. Each sensor is magnificently connected with a microcontroller and the controller is connected with the raspberry pi. The camera and the GPS are also interfaced with raspberry pi. Outcomes signify that the mobile operated robot can be operated by wireless transfer of computer instructions to raspberry pi than the raspberry pi move the instructions to the microcontroller and then the controller gives the signs to a driver in respect to operate the robot. The GPS is used to direct the position of the robot.

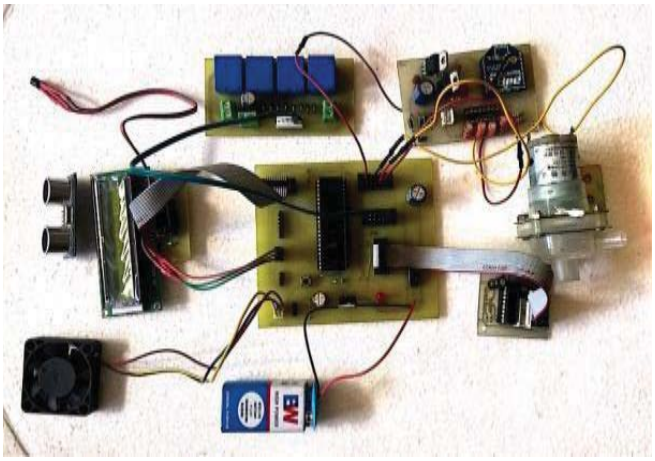

Fig. 6. setup for Node2

Now it's about the node 2 that has a motion detector, temp., humidity sensor, cooler. They all are interfaced with the microcontroller board. These sensors provide values to the controller after that the controller manages all the devices that are interfaced with automatic mode and also dispatch the variables of sensors to the raspberry pi and then raspberry pi send this to operator phone with the help of wireless connectivity. Outputs display the result when the temp. Increases from the marked place then the cooler will start and if the humidity goes down from the marked place than the microcontroller gets the operating signs to form the raspberry pi via Zig Wave and according to that, it takes the corrective measures.

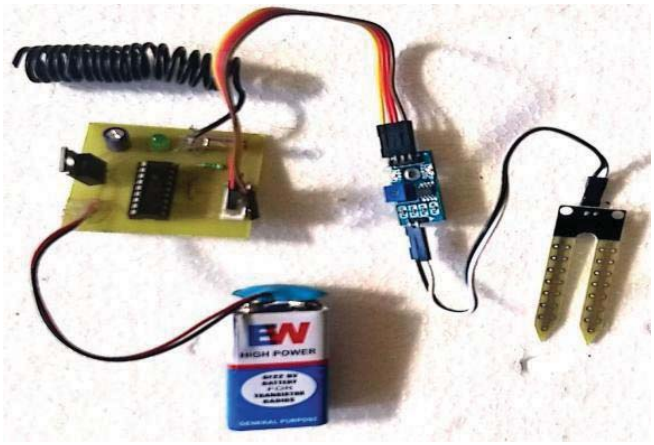

Fig. 7. setup for Node3

In this figure, the node 3 has a moisture sensor that is interfaced with HTI2E. Dirt moisture sensor transfer the information using HT12E Encoder IC and a Rf transmitter for

node 2 which is under processing by a microcontroller and according to that water pump is turned on or off.

VI. CONCLUSION

All the sensors and all the microcontrollers of all the nodes are successfully implemented with raspberry pi and communication via remote is achieved among all the nodes.

Each and every experiment indicates the project is the right solution of all the farm activities. Water overflow issue, volume problem is solved by the robot which is remote controlled, the soil distribution centre and the water structure are different from others. The implementation of these structures in the farm can help to raise the growth of the crops in the field.

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