

Implementations of the IoT Devices in the Agriculture Fields

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ABSTRACT: There is so many research is done to apply IoT (Internet of Things) in agriculture field. In this paper, we have implemented the farming by devices that will manage all things automatically by using IoT, devices. Device communication and intelligence is used for smart agriculture process. We have used various process smartly with devices and communication between them. We have developed the system which will help to sprinkle water or we can provide lights or anything needed for particular plant or in the area of the field.

Keywords: *IoT, Wireless Sensor Network, Arduino.*

I. INTRODUCTION

IoT is being implemented in such a way that we will need less manpower and all machines, smart devices and communication through wire or wireless we can develop systems that can make big things very easy and useful for normal people.

IoT is the next generation technology, where devices will communicate with each other and things will be done. Communication means data that need to transfer and for control over the work that is needed to be done that will be handled by devices itself. And we don't need to do any action for handle them. We just need to provide the power to devices that are working for us and rest will be taken care by the smart system that we have developed.

In agriculture, what we can develop is that in India or anywhere where farming is the key thing there we have seen that farmers need to do so much hard work and result as per their hard work is not paid off. So, we can develop automatic farming solutions for them. And the result will be something different and progressive.

In development of IoT we can use microprocessor or microcontroller. If we want to develop some small systems or we just have to hands on some system development in IoT we can use microcontroller.

We can use Arduino as micro controller or Raspberry pi as Micro controller. We need some transmission devices such as Bluetooth or infrared or Wi-Fi to transmit the readings of the sensors through transmission medium because the farm has large area for farming, everywhere we

cannot transmit data through wired medium so we are using wireless medium to transmit.

To provide power to each device or sensor, we can put solar energy plate to consume the natural power and one little battery to store that captured power.

This battery power has enough capability to run the small sensors and circuit for reading the values of sensed data. We have to put this solar mechanism in some distributed area so that one solar system can provide power to two-three circuits in farm

In order to read and transmit the data, first sensor read the data as per the condition of leaf, soil and water etc. microcontroller receive the data from sensors and transmit that data through transmission medium to the target storage. That storage can be cloud or local database server, which stores the readings, analyses the readings and gives the command to the action machines like water pump, lights, fans, camera etc.

This all process works on 5v signals which is generated by the Arduino and this signal decides that target machines are to be started or not.

Internet of Things

When data is getting, merged and will be in proper manner, it will be connected to people in more valuable manner and mostly it is relevant. Process will be there to deliver the right thing to the peripherals. And then physical devices that are connected will make action that we have already programmed in hard code. That is basically known as IoT.

Two things matter the most for implementation:

A. Embedded System

Embedded system means the chips and connections that are needed to make the communication and should be able to have functionality to work according to plan.

Many things are come together and they will make sense that it can work through connection that are provided to it by us and it should give us the output as they are meant to be design.

Such systems are called embedded systems because they will be needed some processor, RAM and all that things which completes the system.

B. Embedded Board

Embedded board are part of embedded systems that board are to be fit into the systems that will make one whole systems into one.

To make one whole system several boards are needed and to be fitted into one system. All boards and peripherals will be attached to the system and boards will be fitted into the system.

IDEs are also developed to work with IoT. Some of the famous IDEs are there to work with IoT. IDE means Integrated Development Environment that is specially developed for developers to work with IoT.

Boards are generally a complete KIT to work with. We have used some circuits and some sensors to work in agricultural field. That kit will be connected to the system and we can actually load our program in that. Loaded program will listen to the device activity and it will work according to loaded program.

There are microcontroller and microprocessors to work with several peripherals. Like Arduino, Raspberry Pi, etc. with these devices we can control and work with some of more devices

General Introduction to Arduino Boards

Arduino is an open-source electronics platform based on easy-to-use hardware and software.

Arduino is the combination of some wires and devices that will be controller between the loaded programs as we have discussed above. It will help us to control our sensors, our pump and our program. It will be of the smaller size compared to Raspberry pi.

Arduino is the board that we have used in our development. We have load the program in its memory and

connected the pump and sensors to it by jumper wires. That was the total AC – DC power conversion.

Future Farming

Future farming is the useful to do farming in modern way in which machine do their work by itself based on some sensors. Sensors sense the environment things like temperature, humidity, moisture, sunlight and act accordingly to provide water and fertilizers to the plants.

In this type of farming, farmers use more advanced technologies to maintain the health of plants and provide the solution if any diseases seem in to the plant.

One way to outlook farming is as a through matrix algebra. A farmer must constantly manage a set of variables, such as the weather, his soil's moisture levels and nutrient content, competition to his crops from weeds, threats to their health from pests and diseases, and the costs of taking action to deal with these things. If he does the algebra correctly, or if it is done on his behalf, he will optimize his yield and maximize his profit.

The job of smart farming, then, is twofold. One is to measure the variables going into the matrix as accurately as is cost-effective. The other is to relieve the farmer of as much of the burden of processing the matrix as he is comfortable with ceding to a machine.

MICROBES, though they have a bad press as agents of disease, also play a beneficial role in agriculture. For example, they fix nitrogen from the air into soluble nitrates that act as natural fertilizer. Understanding and exploiting such organisms for farming is a rapidly developing part of agricultural biotechnology.

II. TERMINOLOGIES FOR FARMING IN IoT

- Active Digital Entity
- Actuators
- Address
- Application Software
- Association
- Communication Model
- Constrained Network
- Controller
- Credentials
- Sensors [Wireless / Wired]
- Global Storage

Every network of IoT is connected with global storage like cloud storage.

• Internet
Internet is the major factor which is play a major role in the IoT. According to the definition of IoT, every device is

connected with each other and there is server using network. And that server is connected to internet.

- Location Technologies

A device that have capability to communicate with satellites and provide the location of a device e.g. GPS, RTLS, etc.

- Microcontroller

A microcontroller is used to control the devices as per the logic [code] added by the programmers. It is a small computer which have single integrated circuit with processor core, memory and programable I/O peripherals. It has a memory in the form of NOR flash or OTP ROM. It also has a small amount of RAM

- Wireless Communication Technologies

This term associated with a network which is wirelessly connected with some devices for transfer the data for communication purpose.

- RFID

RFID is an electromagnetic tag to sense that device for some purposes like counting and recoding. This tag communicates with other devices with radio frequency.

- AutoID and Mobility Technologies

Automatic Identification and Mobility (AIM) technologies are used to manage connected devices and get accurate result and reading from it.

AIM technologies include range for worldwide devices, which are available in the market for IoT.

AIM also includes mobile computing devices that give facility for hand held devices such as mobiles and tablets.

III. CURRENT IMPLEMENTATIONS

- Sensor-based field and resource mapping
- Remote equipment monitoring
- Remote crop monitoring
- Predictive analytics for crops and livestock
- Climate monitoring and forecasting
- Livestock tracking and geofencing
- Stats on livestock feeding and produce
- Smart logistics and warehousing

IV. OUR IMPLEMENTATIONS

We developed working model for watering the plant in such a smart way that if soil of plant needed water at that time the water pump automatically starts and water reached to the plant. When that soil has enough water then the water pump automatically turned off.

For develop this type of logic we used following things.

- 1 Arduino board
- 1 Relay (5 v)
- 1 Bread Board
- 1 Diode
- 1 soil moisture sensor
- 1 water pump
- Some jumper wires

Fig.1 show the status of the pump which used to sprinkle the water in the dry field.

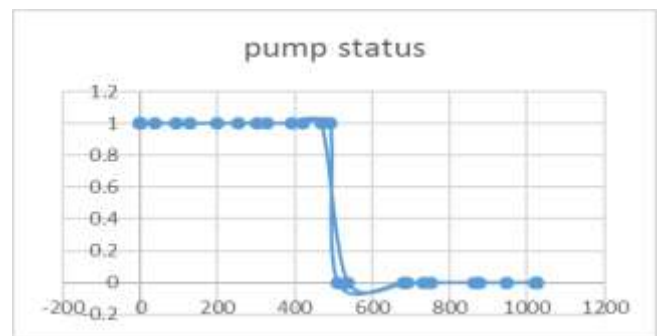
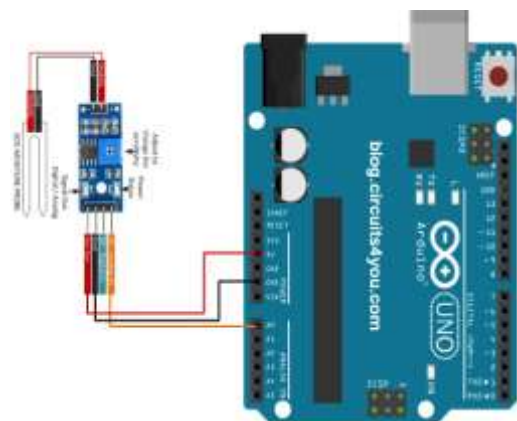


Fig. 1 Status of the pump



V. CONCLUSION

The IoT technology in agriculture will help the farmers to reduce their work and to produce the maximum output from the fields. We can sprinkle water or we can provide lights or anything needed for particular plant with devices only and less manpower will be needed.

We have tested the water level and moisture in sand and it works perfectly.

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