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Abstract

Internet of Things is an emerging topic of various significances such as Technical, Social and Economical. The main enabling factor of this promising prototype is the summation of several technologies and communication solutions. Identification and tracking technology with wired and wireless sensors enhance the intelligence for smart object. Data-driven techniques that can be implemented with the Internet of Things helps to boost agricultural productivity by increasing yields, reducing losses and cutting down input costs. This paper is going to propose Internet of Things based various agriculture techniques. This includes automatic compost spreader which will spread the compost in between the plants. For the protection of farms from wild animal, low-cost crop protection system. In addition to that for profitable farming AI based drip irrigation system and resourceful Polly house techniques for maximum production. These technologies will be the boon for the farmers all over the globe as farmers will get real-time updates within very low cost with proficient, and reduced manual efforts. This paper addresses the agronomics solution with enhanced use of data-driven techniques that is the Internet of Things with incredibly reduced manual work with high efficiency with reduced cost and losses.

Index Terms: IOT, Connectivity, Farming, innovation, low cost etc.

1. INTRODUCTION

Smart farming is a concept which is quickly catching on in the agricultural business. Smart farming Offers high-precision crop control, a very efficient collection of useful data, and automated farming techniques, there are clearly many advantages a networked farm has to offer.

A recent Beecham's report entitled *Towards Smart Farming: Agriculture Embracing the IoT Vision* predicts that food production will increase by 70 percent by the year 2050 in order to meet our estimated world population of 9.59 billion people. It also describes growing concerns about farming in the future: limited arable land, climate change, and costs/availability of fossil fuels. So, the solution is a two word thing that is Smart farming.



Of the many advantages Internet of Things brings to the desk, the ability to innovate the landscape of current farming methods is definitely ground-breaking. Internet of Things sensors are capable of providing farmers with real time information about crop yields, rainfall, pest infestation, and soil nutrition are extremely valuable to production and offer precise data which can be used to improve farming techniques over time. New hardware, like the corn-tending Internet of Things implemented Rowboat, is making strides by pairing data-collecting software with robotics to fertilize the corn, apply seed cover-crops, and collect information in order to both maximize yields and reducing waste.

Another direction in which smart farming is headed which involves intensively controlled indoor growing methods. The Open AG Initiative at MIT Media Lab uses "personal food computers" and an open source platform to collect and share data. The collected data is termed a "climate recipe" which can be downloaded to other personal food computers and can be used to reproduce climate variables such as carbon dioxide, air temperature, humidity, dissolved oxygen, potential hydrogen, electrical conductivity, and root-zone temperature. This allows users very precise control to document, share, or recreate a specific environment for growing and removes the element of poor weather conditions and human error. It could also potentially allow farmers to induce drought or other abnormal conditions producing desirable traits in specific crops that wouldn't typically occur in nature.

2. Traditional Farming

In traditional irrigation system in which is done by flood method, by giving irrigation to crop with flood irrigation system there was huge loss of water. Now a days to overcome this problem irrigation is given by sprinkler and drip method. By irrigating crop with sprinkler system, there is saving of water up to 50% and with drip irrigation system, farmers can save 80% water. This system of irrigation is found to be useful for growth of the crop especially for shallow soil and on undulated land. Due to drip method, nutrient uptake of plant is increased, structure of soil is maintained, and fustigation is directly given to the plant and also reduction in the weed.

3. Smart Drip Irrigation

Drip irrigation is formed automation by dominant it by Mobile application. The serial information collected from the Sensors area unit send to cloud and info server for information mining, it's done to look at massive pre-existing information so as produce the new information. The amount of wireless sensors is placed arbitrarily over 2-D plane. Every detector is integrated with a networking device and information is received by the ARDUINO-UNO. The info causation and system management is done by victimization Raspberry Pi. [1]

Through the detector networks, agriculture are often connected to the microcontroller, which allows making affiliation between farmer and crop. The very special Main objectives area unit responsibleness and longevity, sensor networks should be remotely manageable and low cost[6].

The Arduino Uno board is employed for the dominant and receiving data from wet sensors. The data is distributed to issue speak cloud server to research and supply graph. The system is operated victimization net application.[7].

The storage tank is employed for the drip and flow management is done by small controller supported the soil wet and temperature. It's controlled victimization the robot application.

The drip is controlled by causation the SMS. The system use ATMEGA8 small controlled to integrate all the modules. DTMF (Dual tone multi-frequency) unmistakably in designed for telephony sign over voice quality phone lines. [2]

The sensor nodes area unit placed within the paddy and information is collected from every node by a base node (or) sink node and send to the mobile through web and dominant the water flow is finished through the mobile application .

The volumetric density of the water within the soil (soil moisture) is Maintained by victimization Cloud, IoT and robot system (Blink application)..

4.Auto Light Intensity Management System

In many agronomics techniques light is one of the most affecting factors throughout the journey of the life of the plant. The light is generally natural light that is sunlight but a drastic change in productivity can be implemented by supervision of artificial light. But the drawback of this technique is that the consumption of the electrical energy which is not affordable in many cases. Internet of things provides a solution to this situation. An energy consumption issue can be solved by using solar panels with converts solar energy into electrical energy which will effectively reduce the cost and a permanent solution over energy consumption. But the switching artificial lights on or off is still manual work which is inefficient. This manual work can be replaced by the technology, Internet of Things through which electronic components will establish a communication which can itself determines the light intensity and can switch the artificial lights operated on solar panels on or off. The light intensity can be determined using the LDR sensor connected with an Arduino which is a microcontroller. The LDR sensor has the inbuilt potentiometer which can decide at which light intensity the LDR sensor should respond.

5. Spray Drone

The advancement of technology has modified with time and drones utilized in agriculture is an awfully ideal example for this. In present, agriculture is among the main firms to incorporate drones. Drones are being used in agriculture to boost numerous practices of farming. The processes that surface-based and air-based drones are taking care of in agriculture are irrigation, crop health assessment, crop spraying, crop screening, planting, and analysis of field or soil.



Fig : Spray Drone

Some of the benefits of utilizing drones embrace crop health imaging, easy use, integrated GIS mapping, potential to boost yields and save time. With designing and strategy supported existing information gathering and process, the drone technology offers a hi-tech makeover to farming domain.[3]

With the assistance of knowledge we tend to gather from drones, it offers United States insights of plant health indices, field prediction, plant reckoning, cover cowl mapping, plant height measure, mapping of field water, measure of storage, reconnaissance mission reports, measure of atomic number 7 in wheat, measure of pigment, mapping of voidance, mapping of weed pressure and far additional.

What is more? The drone conjointly gathers the thermal, multispectral, and visual imagination at the time of flight and so the lands within the same place it began to fly.[4]

6. Wild animals crop protection

The trouble of wild animals is one of the major problems farmers are facing. Wild animals are a challenge for farmers throughout India. Animals such as deer, bear, wild boars, rabbits, moles, elephants, monkeys, and many others may cause serious damage to crops. They can damage the plants by feeding on plant parts or simply by running over the field and trampling over the crops. Therefore, wild animals may easily cause significant yield losses and provoke additional financial problems. Agricultural fences are the traditional approach farmers have used until now.

Modern farmers are using electric fences. But the problem with electric fences is that farmers have to pay the cost of 24*7 electric utilization. Also in electric fences, a lot of energy gets wasted and they are useless at times of the power failure.



IOT and Using Solar Power provides the best and low power consumption solution over this. Using the passive infrared sensor (PIR sensor) we can save a large amount of power. PIR sensors allow us to sense motion, almost always used to detect whether an animal has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. We can use the PIR sensor along with solar-based electric fences. When the sensor will detect the motion the Current will flow through the wire automatically. When there will be no animals, no motion will be detected and hence no flow of current.



Fig: Passive Infrared Sensor

7. Agriculture Fires: Automated alert system

Alarming images from National Aeronautics and Space Administration (NASA) show large parts of India dotted with fires. The images in April 2018 show scary pictures of fires stretching across Indian states of Uttar Pradesh (UP), Madhya Pradesh (MP), Maharashtra, Chhattisgarh, and even some southern states. [5]



Although some of these dots may be forest fires, according to Hiren Jethala, research scientist at Nasa Goddard Space Flight Centre, fires in central India may be mostly crop fires. And many times farmer faces a heavy loss due to these fires. These fires are worst in case of Cotton.

Internet of things can help farmers by sending the message whenever there is a fire on the farm. For this gas sensor and temperature sensors will be used simultaneously. As the Content of Oxygen will go down beyond level and there will be an increase in the surrounding temperature automatically buzzer will beep and the high priority text message will be sent to the farmer.



Fig: smoke sensor

8. Benefits

- Farmers will get real time updates.
- Farmers will be able to analyse the past data in very efficient manner.
- Reduced cost.
- Higher efficiency as each n every work is done by technology.
- Remote Monitoring : Accessibility of sensor over a wide range with GSM
- Low power consumption using solar panels
- Water Conservation
- Increased quality of production
- Accurate farm and field evaluation.

9. Limitations

- Maintenance issue
- Most farmers are not well aware of this technology
- Faulty sensor may generate faulty data

10. CONCLUSION

Hence the main target behind all the innovations in the farming field can be achieved by the means of internet of things where the Arduino UNO is used to connect all the sensors and electronic devices with each other and which is easy to program. This projects can be achieved in very less time and money and can be afforded by maximum farming techniques all over the world .

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