

RESEARCH OF VARIOUS METHODS AND SENSORS FOR IOT INFUSED AGRICULTURAL PRACTICE

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Abstract: In this faster growing network and internet based environment with tremendously agile and efficient technology, every aspects of our lives are being influenced to use these technologies to yield and ease our day to day work exponentially. Whereas agriculture in today's world is the only source of food for mankind. In such a great advancing environment of technology and machines agriculture still has many drawbacks and limits to overcome. This paper makes a research on how IoT in today's generation can effortlessly make an impact on the quality and as well as the quantity of the production of crops by pervading this rapidly growing technology.

Keywords: Agriculture, Internet of Things, Sensors.

1. INTRODUCTION

As we know the mankind's only source of food is agriculture. Without farming it would be difficult for us humans to rely on any other source of food. Agricultural practices or farming can be hazardous. Which will require modern technologies and ideas to make these work easier. Many possibilities lay beyond just two clicks on our electronic devices. This new era of "IoT" makes every other task easy and handy. Merely a gesture is enough to trigger a machine to get the work done.

According to the UN projections, world population will increase from 6.8 billion in 2015 to 9.1 billion in 2050 that indicates food production has to be increased to feed the corresponding population. And, the agriculture industry is accountable for fulfilling human's need for food, energy, and shelter to a greater extent. The agriculture industry comprises less than 5 percent of the combined GDPs of the world.

Bureau of Labor Statistics reveals that, employment of agricultural workers is projected to decline 3 percent from 2012 to 2022^[1]. Farm owners or farmers have to sustain the productivity, increase yield and feed 2.3 billion people by 2050^[2]. The only solution to the problems is modernizing agriculture. Growth in agricultural sector is vital for the development of economic state of the country. Till now there are places where farmers use traditional methods of farming which results in the considerably low yielding of crops and fruits. This issue raises an awareness in the agricultural science area to use all the modern science to increase the yield, and also meet the demand of growing population. There are a number of other factors which affect the production of the crops. Environmental problems, lack of rainfall and proper irrigation methods. Insects and pests which harm the crops in a great extent. Use of poor quality fertilizers affects the crops as well as the fertility of the soil for future crops. Improper and traditional harvesting practices that lead to wastage. Possibilities of theft of harvested crops. Farmers face many more problems to store the harvested crops. This paper makes a research of various possibilities that can be incorporated into the field of agriculture for the betterment of society.

2. METHODOLOGY

Determining best crops for the piece of land is necessary as it is for us to consume best quality of food for better and healthy life. Every crop requires different atmospheric conditions to grow. It is obviously a tricky job for a person alone to decide which crop to cultivate and where to cultivate. This problem can be handled by making use of a drone and multiple other sensors. All we need to do is to remotely control the drone use it for the in-flight observation and monitoring that gathers data like visual, thermal, multispectral imagery, air pressure, humidity, the weather condition at resolutions up to 1 cm/pixel. This data will give an upper hand for the farmers to decide on which crops to cultivate.

Thermal imaging is used for soil salinity detection. Soil salinity causes a severe environmental degradation which hinders the crops growth and overall regional production. Thermal imaging can also be used to determine crop yield estimation. Thermal imaging can be used to estimate yield as thermography is based on sensing an object's own heat radiation.

Pressure is important because it is related to volume, density, and temperature. If the air pressure is high this basically means there are lots of sinking air molecules and weather will be clear. This favorable weather conditions are good for field work. If the air pressure is low this indicates that there lots of air molecules rising up, showing the chances of cloudy weather or rains.

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2.1 *Electrochemical sensors:*

Provide necessary information used in precision algorithm like, ph and soil nutrients. Sensor electrode work by detecting ions in the soil. Sensors mounted specially designed to sleds help in gathering, processing and mapping soil chemical data.

2.2 *Mechanical sensors:*

Provide an estimation for soil mechanical resistance. These sensors use a mechanism that cuts through the soil, and records the force by strain gauges or load cells. However these sensors are not commercially available. Traction control system or draft sensors on tractors can do the same job.

2.3 *Electromagnetic sensors:*

Electromagnetic sensors use electric circuits to measure capability of soil particles to conduct or accumulate the electric charge^[3]. Electromagnetic soil properties, are influenced by soil texture, salinity, organic matter, and moisture content. In some cases, other soil properties such as residual nitrates or soil pH can be predicted using these sensors^[3].

2.4 *Moisture sensors:*

Assess moisture levels in the soil using a dielectric constant. Basically an electrical property that changes its properties according to moisture levels in the soil.

2.5 *Thermal sensors:*

An infrared thermal imaging system comprises of a thermal camera equipped with infrared detectors, a signal processing unit and an image acquisition system.

2.6 *Barometric pressure sensor:*

Barometric pressure sensors (barometers) measure the air pressure. Air pressure and air temperature should be evaluated for accurate wind estimation, however this data could be obtained from nearby weather stations, and hence they are not considered an essential part of a measuring system.

2.7 *Passive Infrared (PIR)*

Passive infrared motion sensors detect body heat. Used mainly in home security systems. When the sensors are warmed up they can detect heat and movement in the surrounding area, making a grid. The sensors fire up the alarm system connected to it, if they start sensing rapid change in the energy levels or find too many blocks in the grid zone.

2.8 *Capacitive proximity Sensors*

Proximity sensors identify the presence or the absence of objects. Capacitive proximity sensors can detect both metallic and non-metallic targets^[4]. Can be used to detect empty cattle food vessels. Which would notify the farmer^[4].

3. WORKING

Water supply at right time with right amount of quantity, is vital job in maintaining and monitoring the plants growth. Water management remotely is also difficult specially when there is scarcity of water at remote and rural areas. Water has to be used in the best possible way in such cases. Connecting the humidity sensors to a monitoring system which control the water valves can solve the problem with great ease.

Weather forecasting is a very important aspect of farming. Crop yield and harvest proportionally depends on the weather. With techniques such as air pressure sensing and accurate atmospheric pressure sensing devices this work can be done precisely. This feature would help the farmers to plan accordingly as per the data being collected and summarized by the monitoring systems.

Anyone today will want to have good quality food and water. Having good food is not only essential in today's world but also having the right amount of nutrients. Using these modern technologies farmers can maintain and monitor these level of nutrients in the food. Each and every sensor relates to a specific ion. These ions can be measured in real time and data can be sent to the analyzer on the farmer's phone. Upon getting this information, farmer can mix the soil nutrients, monitor the crop yield, maturity and color.

After harvesting the crops the major challenge arises while storing them. Efficient storagetechniques involve monitoring of accurate temperature, air pressure and humidity in the storage warehouses. With integrating various IoT sensors and devices would allow the farmer's to get data while sitting at home.

4. FUTURE ENHANCEMENT

This is just a research paper which can be implemented in the future. This makes production of food much efficient where the farmers need not worry about when and which crop have to be cultivated. The sensors included in the project will take care of the water supply, weather forecasting, wind detection etc. for the crop we cultivate which leads to the effective production of

crops. This project uses sensors to identify the empty food vessels to notify the farmer when to feed the cattle. This project also uses sensors to monitor the temperature, humidity and air pressure so that the harvested crops are stored efficiently.

5. CONCLUSION

IoT based farming techniques can bring up an evolutionary change in the agricultural field. The usage of many sensors can ease the production of the crops as well as it can reduce the wastage of resources and will also increase the profit for the farmers. Electrochemical, Mechanical, Electromagnetic and Moisture sensors are used in this project to monitor the soils humidity, chemical properties, moisture levels etc. Passive infrared and thermal sensors are used to monitor the fence. Biometric sensors are used for weather forecasting. And Capacitive proximity sensors are used to sense the presence or absence of the objects. This system brings Internet of Things technology to the food production. This can be one of the “world’s most advanced farming technologies.”

6. REFERENCES

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