POTENTIAL MODEL FOR SMART AGRICULTURE FOR FRUITS USING IOT & WIRELESS SENSOR NETWORK TECHNOLOGY

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Introduction:

Agriculture is considered as the basis of life for the human species as it is the main source of food grains and other raw materials. It plays vital role in the growth of country's economy. It also provides large ample employment opportunities to the people. Growth in agricultural sector is necessary for the development of economic condition of the country. Unfortunately, many farmers still use the traditional methods of farming which results in low yielding of crops and fruits. But, wherever automation had been implemented and human beings had been replaced by automatic machineries, the yield has been improved. Hence,there is need to implement modern science and technology in the agriculture sector for increasing the yield. Most of the techniques signify the use of wireless sensor network which collects the data from different types of sensors and then send it to main server using wireless protocol. The collected data provides the information about different environmental factors which in turn helps to monitor the system. Monitoring environmental factors is not enough and complete solution to improve the yield of the crops. There are number of other factors that affect the productivity to great extent. These factors include attack of insects and pests which can be controlled by spraying the crop with proper insecticide and pesticides. Secondly, attack of wild animals and birds when the crop grows up. There is also a possibility of thefts when crop is at the stage of harvesting. Even after harvesting, farmers also face problems in storage of harvested crop. So, in order to provide solutions to all such problems, it is necessary to develop an integrated system which will take care of all factors affecting the productivity in every stage like; cultivation, harvesting and post harvesting storage. A system which is useful in monitoring the field data as well as controlling the field operations which provides the flexibility is proposed.

Key Features:

1. Reduced human work and increase in productivity
2. Automation of irrigation
3. SMS alert could be sent to predefined numbers
4. Saves the crops from getting spoilt

Objectives:

The main objective of this project is as follows:

- Increase the accuracy of farming activities
- Automating the manual things to IoT based digitization
- Keeping track of data for future analytics
- Assisting the farmer with an Agri-Bot
- To make use of solar energy
- To work fast and accurate
- To be time efficient

Methodology:

The system is divided into 2 parts,

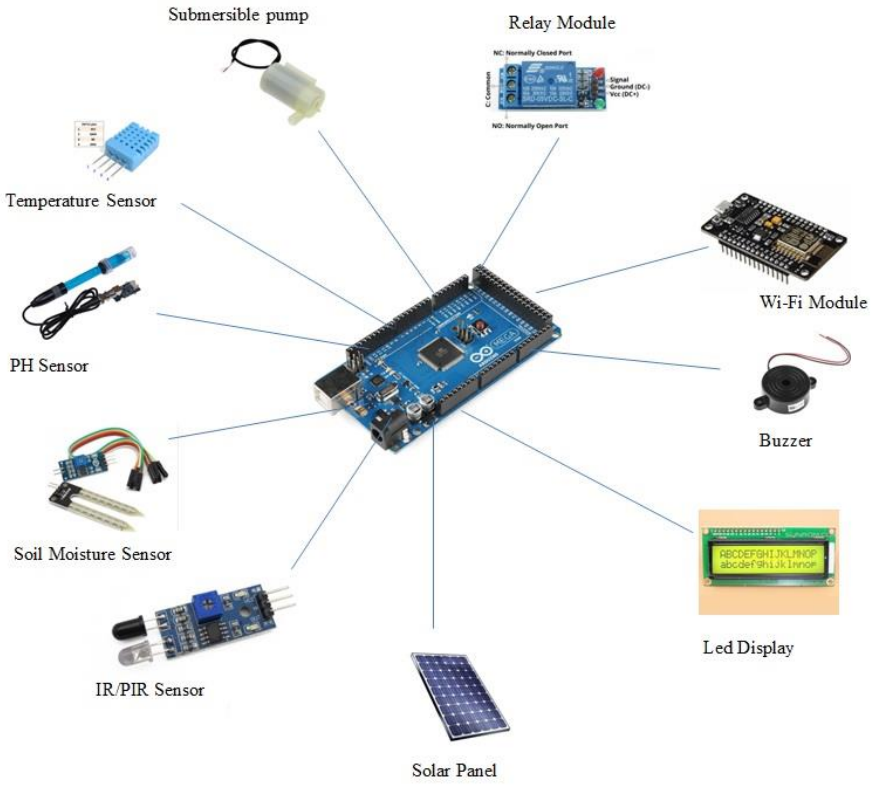
1. Agricultural system
2. Protection system

1. Agriculture System

- This system uses temperature level sensor and soil moisture sensors along with the actuators
- Based on the data acquired by the sensors , certain dashboards are created for the monitoring the crops
- Whenever there is a low value for the soil moisture or the temperature increases content then the water pumps are turned On
- Whenever there is a low value for the pH content then the pumps containing fertilizers are turned On

2. Protection system

- This is the second and important part of the main system where the crops are usually protected from animals or birds which might invade the crop fields.
- Here, an IR /PIR sensor is used to detect the motion of animals which invade. Once, the motion is detected, then the Buzzer can be activated to scare off the animals



System Architecture

- The setup mainly includes the Arduino mega as the main board and it has been connected to various sensors, pumps and actuators to perform the tasks based on the values that are being sensed by the sensors digitally.
- Sensor technology is to be used for the monitoring and controlling of the pumps and the actuators and also to check the condition in which the crops are present easily and in detailed manner both on the mobile SMS and over the ThingSpeak cloud.
- The main board is Arduino MEGA, that is being the power house and the control house for the entire system and the rest of the hardware components are connected to it for the operational usage.
- Sensors such as DHT11/Temperature sensor, pH sensor, soil moisture sensor, IR/PIR sensor are mounted on to the system to sense the data digitally.
- Actuators such as water pump and the fertilizer supply pumps are being implemented for the automated supply of respective liquids to the soil and crops. Hence, we have used the submersible pumps used in our project.
- If the temperature and relative humidity is high or low, we get notified over SMS service to the prescribed phone number, stating that the temperature and the relative humidity is high or low and also we receive the values that are generated when the sensors generate the data.
- In case, if any intruders such as animals and birds are found to be detected in the surroundings, it's because, we have implemented the IR sensors around the walls of the compound and near the inventory. If found, immediately the action will trigger, indicating that the animals are detected, thus, the buzzer will power on making a sound, so that we can woo the animals away from the field. If the birds are detected, then the laser light will get triggered and it starts rotating, so that the birds

are very sensitive to such sharp lights and the fly away.

- A GSM toolkit has been implemented to receive the timely notifications about the situation in the farm field digitally.
- The primary power source for the system is the solar powered battery, which gets charged when it gets the sun light and supplies power to the system, and for backup power, we have added the chemical batteries for the discontinuous service.
- The digital values of the temperature, relative humidity, pH level and the soil moisture are being graphed and monitored over a cloud platform namely, 'ThingSpeak cloud'.

Results and Conclusion

In this project, an overview of smart agriculture system for fruits, using internet of things and Wireless Sensor Networks with the respective potential system in combating with the problems faced by the farmers and the rural people who are dependent on the yielding of fruits and crops. Through the successful implementation and development of these emerging technologies during this period, we are focusing the industry 4.0. The burden on the farmers can be drastically reduced by shifting from traditional methods to the smart methods using smart technologies.

The system will generate the digital data such as temperature, relative humidity, pH level and the soil moisture, which will be sent frequently to the prescribed phone number, stating the values whether they are high or low, and accordingly the water and pH motors will run and provide the required amount of water or the fertilizers to the crops. Also, if any intruder is encountered, we can know that either animals or birds have entered the fields, in such constraints, buzzers and led lights are used to woo away the animals and birds to protect the crops.

The data that is digitally generated is sent to the 'ThingSpeak cloud' for the generation of report and periodical graphical representation for the future analysis and to take prominent steps for the better yields.

Scope for future work

Through the process of customization, this system can be modified to a smart application like, mobile application, touch screen control & display panels, etc. as the technology changes. If new requirements arise from users, and if some more problems are identified that are being faced by the farmers, we can adapt the new additions to the current model and we can enhance the functionality of the product that may require a new version to be introduced.

This system can be further developed to measure the activity of the farmers/users by implementing a high resolution sensors and cameras to support and enhance the safety and production of the yield. Besides, to support safety of yielded fruits, its functionalities can be enhanced by incorporating audio/video recording capabilities for best service over chat bots and other robots if added in future, to the land.