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Design and implementation of Smart Agriculture using Embedded System

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Abstract: ***A smart way of automating farming process can be called as Smart Agriculture. By implying an automated system we can eliminate possible threats to the crops by reducing the human intervention. The major emphasize will be on providing favorable atmosphere for plants. These agricultural automated systems will help in managing and maintain safe environment especially the agricultural areas. Environment real time monitoring is an important factor in smart farming.***

A GUI based software will be provided to control the hardware system and the system will be entirely isolated environment, equipped with sensors like temperature sensor, humidity sensor, photo emitter. The controllers will be managed by a master station which will communicate with the human interactive software. The system will provide smart interface to the farmers.

This smart system can increase the level of production than the current scenario. This system will realize smart solution for agriculture and efficiently solve the issues related to farmers. The environment will not be the barrier for production and growth of any plant and we can overcome the problem of scarcity of farming production.

Keywords: Smart farming, Embedded systems, Real time monitoring, Sensors**.**

1. Introduction

From past years' farmers face problems due to climate change or due to natural disasters like floods, famines, etc. It raises the topic of smart farming or smart agriculture but the misconception about the smart farming is many people think that smart farming is about automated system which starts the motor pump and start the water flow whereas some people consider that it just monitors the field. But people have failed to notice that what if the system does all these things and try to take its own decision without much interaction with the user. The actual smart agriculture should monitor as well as take required decisions for the plant/crop.

2. Purpose

The aim of the project is to monitor and control the atmosphere of the farm with less human intervention. This smart system can increase the level of production than the current scenario. This system will realize smart solution for agriculture and efficiently solve the issues related to farmers. The environment will not be the barrier for production and growth of any plant and we can overcome the problem of scarcity of farming production.

3. Scope

The automated farms can yield more production of crops. The requirement of the atmosphere of the crop/plant can be fulfilled anywhere due to the controlled atmosphere. This can also make farming as a zero loss business.

4. Literature Survey

4.1 AgriSys: A Smart and Ubiquitous Controlled Environment Agriculture System Authors: Aalaa Abdullah, Shahad Al Enazi and Issam Damaj

In [1], they proposed a smart Agriculture System (AgriSys) that can analyze an environment and intervene to maintain its adequacy. The system had an easy-to-upgrade bank of inference rules to control the agricultural environment. AgriSys mainly looked at inputs, such as, temperature, humidity, and pH. The system also could deal with desert-specific challenges, such as, dust, infertile sandy soil, constant wind, very low humidity, and the extreme variations in diurnal and seasonal temperatures. The system also provided increased productivity, enhanced safety, instant interventions, and an advanced life style. The system made was ubiquitous as it enables distant access.

4.2 Design and Implementation of a Connected Farm for Smart Farming System Authors : Minwoo Ryu, Jaeseok Yun, Ting Miao, Il-Yeup Ahn, SungChan Choi, Jaeho Kim

In [2], they have made a connected farm based on IoT systems for smart farming systems. They have used IoT to provide Internet connectivity for the sensors and controllers of the connected farm, they have deployed the Cube, a standardized device software platform for IoT devices. They also have used the Mobius, an IoT service platform (also oneM2M-compliant) that provides REST APIs with which the data collected from sensors (e.g., CO2 sensor)can be retrieved, but also the control commands can be sent to controllers (e.g., air conditioner). They had implemented a smart phone application that allows end users to remotely monitor and control their connected farm, e.g., turn on air conditioner by pushing a button on the smart phone.

4.3 Smart Design of Microcontroller Based Monitoring System for Agriculture Authors: Nilesh R. Patel, Pratik G. Choudhari, Pawan D. Kale, Nikesh R. Patel, Gau ravkumar N. Raut, Asif Bherani

In [3], they have used microcontroller based monitoring system which was developed and which monitors different environmental parameters like soil moisture, relative humidity and atmospheric temperature. Values of those parameter were transmitted wirelessly using radio frequency wireless module to central unit via microcontroller. Different experiments were performed by them to examine sensors as well as wireless module. It was found that there was little variation in moisture sensor’s reading when it was exposed to different temperature. Wireless module worked effectively when introduce to various obstacles. But they tested only one module. Actual implementation of their system on large scale was challenging task for them.

4.4 Providing Smart Agricultural Solutions to Farmers for better yielding using IoT Authors: M.K.Gayatri, J.Jayasakthi, Dr.G.S.Anandha Mala

In [4] they explained a empirical model of how the Internet of things can be applied to the Indian agriculture. They initially proposed a model outline of how the IoT concept can be illustrated with respect to their Agricultural practices. Later in the construction of sensors they discussed about the various types of sensors and the type of sensors that will be required for their Agricultural purposes. They also discussed about the types of communication that they have for near and far nodes communication.

5. System Architecture

The following architecture consist of three sections:-

1. User Interface

2. Middleware

3. Field

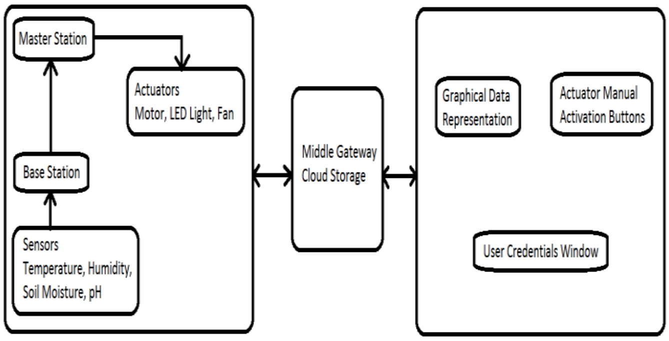

Fig 1: *System block diagram*

1. User interface

It is way through which user can have graphical representation of all the sensor data. The user need to login the session through its credentials. Through this user interface the can manually control all the actuators remotely

2. Middleware

Through this middleware connection between the user interface and remote field can be established. All the data which is collected by the sensors is stored on the cloud storage.

3. Field

Field is a collection master station, which controls all the actuators and base station which is collects all the sensor data and provides it to master station.

6. System Evaluation

6.1 Advantages

- User Friendly.
- Remote Monitoring.
- Increased productivity.
- Enhanced safety.
- Easier agriculture procedures.
- Instant interventions around the clock.
- Advanced lifestyle.

6.2 Disadvantages

- May give variable accuracy.
- Little variation in sensors reading when exposed to different environments.
- Implementation on large scale strenuous.

6.3 Application

• By finding suitable environmental conditions can accelerate farming.

• Site specific data such as soil moisture and yield can be collected comprehensively.

• Digitized and efficient farming practice.

7. Conclusion

The existing system works in a manner in which it firstly does data collection from the farm via the help of sensors, then it sends the data to the server side from where and on which further actions can be taken. The final output of this system is displayed after getting processed by the server side and then displayed onto the mobile phone. Thus, on the basis of literature survey and by analyzing the existing system, we have come to a conclusion that the proposed system will not only aid the farmers but will also help them to digitize their farming practice and in turn help them to yield the best from that soil without being dependent on the climatic conditions.

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