

Assignment – 1 : Smart Agriculture – Advanced Green House Monitoring and Controlling System

Project Title : *“Advanced Green House Monitoring and Controlling System”*

Project Team :

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Broad Statement of the Problem :

We live in a world where everything can be controlled and operated automatically, but there are still a few important sectors in our country where automation has not been adopted or not been put to a full-fledged use. One such field is agriculture. Agriculture has been one of the primary occupations of man since the early civilizations and even today manual interventions in farming are inevitable.

Greenhouse is important part of Agriculture and Horticulture, as it can be used to grow plants and crops under controlled climatic conditions for optimal yield.

Automating greenhouse involves

1. Monitoring and controlling of climatic parameters which are responsible for the growth of plants and crops,
2. Controlling devices in the greenhouse farm from anytime anywhere,
3. Identifying fingerprint of the person entering the greenhouse,
4. Restricting the number of users entering the greenhouse to maintain the carbon-di-oxide level.

The quality and productivity of the plant grows are mainly dependent on the following factors such as, temperature, humidity, light and the level of carbon dioxide. The continuous monitoring of these factors or environmental variables and the optimal green house climate adjustment can enable us to improve the productivity and also to achieve energy saving especially during winter.

Controlling devices is simply automation of greenhouse activities by interfacing the application in the greenhouse through electronics and appropriate communication protocols. This is to improve the comfort and convenience of the greenhouse, make it energy efficient and protect it from possible accidental and incidental threats.

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Large scale greenhouses are mostly built for commercial purposes. So securing the greenhouse and protecting it from unauthorized person is also very important. For this purpose fingerprint identification system is used to monitor people and restrict unauthorized people to enter the greenhouse and the door opens only if the fingerprint matches with the available database.

Greenhouses are constructed to provide the favourable climatic conditions for plants and crops. Favourable climatic conditions also includes the level of carbon-di-oxide inside the greenhouse. More number of people inside the greenhouse may lead to excessive amount of carbon-di-oxide in it. Thus affects the plant growth. So, its important to limit the number of people entering the greenhouse based on the size of the greenhouse and the crops present in it.

The purpose of the project is to construct greenhouse monitoring and controlling system using Wireless Sensor Network(WSN). The aim of the project is to increase the productivity without observing it whole day and to enhance the security of the greenhouse.

The system periodically measures the temperature, light, humidity inside the green house and automate the devices when certain threshold is reached. When the critical changes is detected, the greenhouse manager / owner will be notified. Greenhouse owners can control the appliances of the greenhouse through mobile phones. Security of the greenhouse is maintained by using a biometric – fingerprint identification and the unauthorized person trying to access greenhouse with be notified to the Greenhouse owner. To maintain the carbon-di-oxide level of the greenhouse, only limited number of people are alone allowed inside the greenhouse. The number of people are detected using the camera, and the greenhouse door opens only if the count is acceptable.

Thus, the greenhouse manager will able to react to the critical change as soon as possible and may be able to prevent possible effects of the critical changes.

Objectives of the Project :

The objective of this project is to design a automatic monitoring and controlling system which is a simple, secure, easy to install, microcontroller-based circuit to monitor and record the values of temperature, humidity, soil moisture and sunlight of the natural environment that are continuously modified and controlled in order optimize them to achieve maximum plant growth and yield. To access the greenhouse appliances from anywhere. Also to provide security to the greenhouse.

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It focuses on saving water, increasing efficiency and reducing the environmental impacts on plants production, improves security and accessibility. The user can see the atmospheric conditions of the greenhouse plants on mobile phones and control the greenhouse from faraway places. It is to increase the production of food stuff. To save water, power etc. to increase the productivity and security of Greenhouse.

Benefits of the Stakeholders :

- Communicating directly with stakeholder allows us to learn not only their perspective, but can provide new insights of the product or issue to help us gain a competitive advantage.
- Engaging with stakeholders can ultimately save time and money.
- Groups and individuals may help us identify potential risks before they become threats to our project.
- Engaging with groups and individuals is key to improving accountability within our organization as well as with external audiences.
- Internal stakeholders are the part of the client company : executives, employees, board members and shareholders. Their goal is to solve pressing business problem to optimize the process, increased sales, better insights or some other measurable benefits.
- External Stakeholders lie outside the company, such as customers, regulatory bodies, legal officials and surrounding communities. They want to gain the most benefit from the project with the least risk to their own interest.

Users and Knowledge level with respect to Computer Application :

Greenhouse owners / managers are the direct users of this system. Mostly greenhouse owners are the business people who sell the cultivated products or seeds etc,. to the target market (farmers, nursery owners, grocers, florists etc,.).

To educate them with the automation and security model is much simple and safe.

The interface provided to the user is highly user friendly, simple and easy to install.

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As the users (Greenhouse owners/managers) will interact with the greenhouse devices through handheld devices i.e. smart phones, it is very simple and efficient to manage and monitor Greenhouse remotely.

Motivational Aspects :

In modern greenhouses, several measurement points are required to trace down the local climate parameters in different parts of the big greenhouse to make the automation system work properly.

Conventional monitoring systems using cabling would make the measurement system expensive and vulnerable. Moreover, the cabled measurement points are difficult to relocate once they are installed.

Thus, a Wireless Sensor Network (WSN) consisting of small-size wireless sensor nodes equipped with radio and one or several sensors is an attractive and cost efficient option to build the required greenhouse measurement system.

The greenhouse owner has the special power to monitor and control the entire system within his hands through a mobile phone remotely.

The greenhouse owner / manager can always make sure that the plants growing in the system is of good quality with high yield.

Functional Requirements :

- Authentication of user (Greenhouse owner / manager) whenever he or she logs into the system.
- A verification email is sent to the user if he / she registers for the first time.
- Door should not be opened in case of detecting an unauthorized fingerprint and notifications should be sent to the mobile devices in case of false fingerprint detection.
- The micro climatic changes are notified to the user through mobile device by sensing the atmospheric changes and device automated inside the greenhouse.
 - Temperature and Humidity sensor to sense the heat and amount of water vapour present inside the greenhouse and display readings in LCD. If they go beyond the threshold level, LED glows microcontroller transmits the signal to activate the fan.
 - Soil moisture sensor is used to detect the soil moisture level and do the smart irrigation system. If the moisture content in the soil

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is detected low, LED glows then the microcontroller sends the signal to open the water sprinkler. When its detected high, the sprinkler is turned off.

- If smoke is detected inside the greenhouse notification should be sent immediately to the greenhouse owner or manager and the alarm rings.
- LDR sensor can sense the light intensity. When the light intensity is decreased resistance also decreased and sends output instructions to the user.
- Arduino uno is the microcontroller based on the ATmega328 acts as the brain of the system.
- The ESP8366 wi-fi module enables internet connectivity to the embedded applications. It uses TCP/UDP communication protocol to connect the server/client.
- Cameras are mounted near the door and inside the greenhouse to detect the number of person entering the greenhouse and also person inside the house to control the Carbon-di-oxide level and the information is shared to the user.
- User can monitor and control the greenhouse appliances through smartphone application.

Non-Functional Requirements :

- Reliability
 - It is reliable in terms of data accuracy and time accuracy.
 - Data accuracy – Checked to make sure sensors do not send wrong data.
 - Time accuracy – achieved by programming the hardware and sensor nodes.
- Availability
 - The web interface will always be available.
 - For network to be available, batteries of sensors should be replenished when 50% of the network is unavailable.
- Security
 - The only security constraint will be user information security.
 - when the user does not remember his log in password, a request for a new password can be made.

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- Since an attack to the greenhouse network is not expected we do not need to implement security constraints on the network.
- Maintainability
 - After some time, the batteries of sensors will run out. Batteries should be replaced yearly.
- Portability
 - Though there are portability issues with embedded programming, the code written for sensors will be mostly portable. There are no issues with the other parts of the project.
- Performance
 - The project mostly focuses on energy consumption and availability of the network as a whole. Therefore, the performance is not the most important constraint. Performance is mostly not considered for the sake of power saving.
- Correctness, Understandability, Reusability.

Deliverables(Tentative) :

The term "deliverables" is a project management term that's traditionally used to **describe the quantifiable goods or services that must be provided upon the completion of a project**. Deliverables can be tangible or intangible in nature.

- Requirement specification (document)
- User interface
- Equipment
- Backend development
- Set up of Test system
- Set up of Live system
- Data migration
- User training