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WSN BASED MONITORING SYSTEM FOR GREENHOUSE VEGETABLES

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ABSTRACT :

The design and execution of a greenhouse vegetable supervising system based on wireless sensor networks (WSNs) are presented. The system is made up of a number of sensor nodes that are distributed across the greenhouse and which detect a number of environmental variables, including temperature, humidity, and light intensity. A central base station receives the data gathered by the sensor nodes via a ZigBee wireless network. Growers can remotely monitor and manage the greenhouse environment thanks to the base station's data processing and userinterface display. By giving producers access to real-time information on the conditions within the greenhouse, the technology is intended to increase greenhouse vegetable production's efficiency and efficacy. Thetechnology is effective at monitoring and regulating the greenhouse environment, which improves yields and decreases waste, according to results.

INTRODUCTION

Greenhouse vegetable production has become increasingly popular due to the need for sustainable food production and the demand for locally grown produce. However, because the environment is so dynamic and subject to quick change, maintaining ideal growth conditionsin a greenhouse could be difficult. Wireless sensor networks (WSNs) have been suggested as a technique for observing and managing the greenhouse environment in order to address these issues. A wireless sensor network, or WSN, is a collection of tiny, low-power sensor nodes that can measure a range of environmental factors, including temperature, humidity, light intensity, and soil moisture. These nodes may wirelessly communicate the data they havegathered to a central base station, where it could be processed and analysed. This enables producers to keep an eye on and manage the greenhouse's atmosphere, ensuring that the conditions are ideal for plant growth and development. By giving growers access to real-time details about the conditions inside the greenhouse, this system's main goal is to increase the efficacy and efficiency of vegetable production in greenhouses. Making intelligent decisions on whether to water, fertilize, or modify the humidity and temperature levels is done using this data. Growers may raise profits, enhance yields, and decrease waste by maintaining ideal growing conditions.

Fig.1 Green House Model [2]

WORKING

The conditions of environment inside the glasshouse, including humidity, temperature, light intensity, soil moisture and other pertinent data, could be monitored in real- time using a WSN (Wireless Sensor Network)-based systemfor glasshouse vegetables. Farmers can utilize this information to better their growing conditions, increase cropyield, and enhance crop quality.

To develop a WSN-based monitoring system for glasshouse vegetables, you would need to follow these steps:

Identify the environmental specifications that need to bemonitored: Depending on the type of crops being grown, the environmental specifications that need to be monitored may vary. For example, tomatoes require different environmental conditions compared to lettuce.

Choose the appropriate sensors: Once the environmental specifications have been identified, you need to choose the appropriate sensors to measure them. various types of sensors available, such as temperature sensors, humidity sensors, light sensors, soil moisture sensors, etc.

Design the sensor network: The sensor network should be designed to provide adequate coverage of the greenhouse and guarantee data transmission reliably to a central monitoring station.

Choose the communication protocol: The communication protocol should be chosen based on the requirements of the system, such as the range, data rate, power consumption, and reliability.

Develop the software: The software for the monitoring system should be developed to collect, store, and analyze thedata from the sensors. The software should also provide alerts and notifications when environmental conditions deviate from the desired range.

Test and deploy the system: Once the system has been developed, it could be tested to make sure that it meets the requirements and functions correctly. After testing, the system is deployed in greenhouse for real-world use.

Overall, a WSN-based monitoring system for greenhousevegetables can provide farmers with valuable information about the growing conditions in their greenhouse, allowing them to optimize their crop yields and quality.

LITERATURE SURVEY

Shuo Jia and Yonghui Zhang [1] proposes a WSN- based monitoring and control system for precision irrigation in greenhouse cultivation. The authors argue that traditional irrigation methods can lead to water wastage and inconsistentcrop growth, and that WSN-based monitoring systems can help address these issues. The proposed system includes various sensors for measuring environmental factors such astemperature, humidity, and light, as well as soil moisture sensors to determine the water content of the soil. The data took by the sensors is transmitted to a central controller,which uses fuzzy logic algorithms to determine the appropriate amount of water to be applied to each plant based on the current environmental conditions.

R. Garcia-Sanchez, J. Garcia-Hernandez, and M. J. Castro-Gil [2] proposes a WSN-based monitoring system for greenhouse environment monitoring. The authors argue that monitoring the environmental conditions of greenhousesis important for optimizing crop growth, and that WSN- based systems offer several advantages over traditional monitoring methods. The proposed system includes various sensors for measuring environmental factors such as temperature, humidity, light, and soil moisture. The sensors are connected to a wireless mesh network, which is managed by a central gateway that collects and analyzes the data. The authors developed a software application for datavisualization and analysis, which enables users to monitor the environmental conditions of the greenhouse in real-time.

Y. Ding, H. Zou, and J. Sun [3] proposes a WSN-basedmonitoring and control system for glasshouse environment. The authors argue that WSN-based systems can provide real-time and accurate monitoring of environmental conditions, leading to more efficient use of resources and improved cropgrowth. The proposed system includes various sensors for measuring environmental factors such as temperature, humidity, light, and soil moisture. The sensors are hooked upto a wireless mesh network, which is managed by a central controller that collects and analyzes the data. The authors developed a software application for data visualization and analysis, which enables users to monitor the environmental conditions of the greenhouse in real-time and adjust the settings of the control system as necessary.

METHODOLOGY

By installing a network of sensors that can gather information on temperature, humidity, light, and soil moisture inside the greenhouse, Wireless Sensor Networks (WSNs) could be used to monitor vegetables grown indoors.

Designing and implementing a WSN-based monitoring system for greenhouse vegetables could be done using the following methodology:

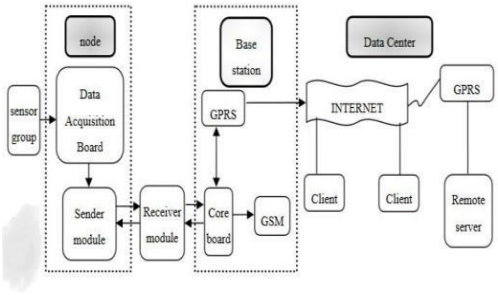

Fig.2 A Monitoring System for Vegetable Greenhousesbased on a Wireless Sensor Network [1]

Define the objectives: The initial stage is to specify the monitoring system's goals, such as improving growing conditions, consuming less energy, and using less water.

Identify the sensors: Finding the sensors that will be utilized to collect data is the next stage. For instance, humidity sensors, temperature sensors, light sensors, and soilmoisture sensors can all be used to gauge the temperature inside a greenhouse as well as the quantity of light and soil moisture present.

Determine the placement of sensors: The location of the sensors within the greenhouse must be decided upon when they have been discovered. This will rely on the monitoring system's particular goals.

Select a communication protocol: The monitoring system's central controller and the sensors must be able to communicate with one another. There are numerous possiblecommunication protocols, including Wi-Fi, Bluetooth Low Energy, and ZigBee.

Choose a microcontroller: To process the information gathered by the sensors and transfer it to the central controller, a microcontroller is needed. The monitoring system's individual requirements should be taken into consideration while choosing a microcontroller.

Develop the software: The data gathered by the sensors must be gathered, processed, and analysed by the monitoringsystem's software. Additionally, based on the information gathered by the sensors, the software must be able to operatethe various elements of the greenhouse, the heating and ventilation systems.

Implement the monitoring system: The monitoring system could be installed in the greenhouse after the hardware and software have been created. This will entail installing thecentral controller and placing the sensors in thepredetermined areas.

Test and evaluate: To make sure the monitoring systemis gathering accurate data and operating effectively, it shouldbe put to the test. Periodic evaluations of the system are alsonecessary to make sure it is accomplishing the goals outlinedof the process.

This methodology could be used to create and execute a WSN-based monitoring system for greenhouse vegetables that will improve growth conditions and consume less resources.

SENSOR DEPLOYMENT	**SENSING**	**TRANSMITTING INFORMATION**	**ANALYSE AND DECISION MANAGEMENT**	**CONTROL ACTION**

Fig.3 Complete process of monitoring and control.

APPLICATIONS

There are several applications for WSN-based monitoringsystems for greenhouse vegetables, including:

1. **Precision irrigation:** WSN-based monitoringsystems can provide real-time data on soil moisturelevels and other environmental factors, allowing for more precise irrigation control. This can lead to more efficient use of water resources and improvedcrop growth.
2. **Climate control:** Crop growth depends on greenhouse temperature and humidity levels, and WSN-based monitoring systems can offer real-time data on these variables. This data could be used to adjust heating, ventilation, and air conditioning (HVAC) systems to optimize crop growth and reduce energy consumption.
3. **Pest management:** Pests can be found in the greenhouse using WSN-based monitoring systems, which can then notify growers to take appropriate action. This could lead to a more sustainable and environmentally friendly approach to pest management by lowering the usage of pesticides and other chemicals.
4. **Quality control:** WSN-based monitoring systems can track various environmental factors that impactthe quality of greenhouse vegetables, such as light intensity and nutrient levels. This data is used to optimize growing conditions and ensure consistent product quality.
5. **Remote monitoring:** WSN-based monitoringsystems are accessed remotely, allowing growers to monitor their greenhouse environments from anywhere. This can save time and reduce laborcosts, while also enabling more frequent and timelymonitoring of environmental conditions. WSN-based monitoring systems offer manypotential applications for greenhouse vegetable cultivation, providing growers with more precise and efficient control over their growing environments.

VI. FUTURE SCOPE

There are several areas of future research and development for WSN-based monitoring systems for greenhouse vegetables, including:

1. **Integration with machine learning and artificial intelligence (AI) techniques:** WSN-based monitoring systems can generate large amounts of data, which are analyzed using machine learningand AI techniques to optimize greenhouseenvironments and improve crop yields.
2. **Development of low-power sensors**: The power consumption of sensors is a major challenge in WSN-based systems. Future research could focus on developing low-power sensors that can operate for longer periods of time without requiring frequent battery replacements.
3. **Integration with precision farming techniques:** WSN-based monitoring systems could be integrated with precision farming techniques, such as precisionirrigation and precision fertilization, to further optimize growing conditions and improve crop yields.
4. **Enhancing network security**: Network security is a critical concern for WSN-based monitoringsystems, and future research could focus on developing secure communication protocols and encryption techniques to protect against cyber threats.

5. **Development of low-cost solutions:** The cost of WSN-based monitoring systems is still relatively high, which limits their adoption by small-scalegrowers. Future research could focus on developinglow-cost solutions that are accessible to a wider range of growers.

The future scope of WSN-based monitoring systems for greenhouse vegetables is vast, with numerous opportunities for innovation and improvement. Advancements intechnology and research can lead to more precise and efficient monitoring and control of greenhouse environments, leading to improved crop yields and a more sustainable approach to vegetable cultivation.

CONCLUSION

Wireless sensor network (WSN)-based monitoring systems have shown great potential for improving the cultivation of greenhouse vegetables. By providing real-time monitoring of environmental conditions, these systems can help growers optimize growing conditions, leading to improved crop yields, reduced resource consumption, and a more sustainable approach to vegetable cultivation. The literature survey shows that numerous studies have been conducted on the use of WSN-based monitoring systems for greenhouse vegetables, with promising results. These studies have demonstrated the effectiveness of these systems in improving crop yields, reducing resource consumption, and improving environmental sustainability. Despite themany benefits of WSN-based supervising systems, thereare still several challenges that need to be addressed. These include the developed of low-power sensors, the integration with precision farming techniques, and the enhancement of network security.

REFERENCES :

1. Cao, X.; Chen, J.; Zhang, Y.; Sun, Y. Development of an Integrated Wireless Sensor Network Micro- Environmental Monitoring System. ISA Trans. 2020, 47, 247-255.
2. Jiang, P.; Xia, H.; He, Z.; Wang, Z. Design of a Water Environment Monitoring System Based on Wireless Sensor Networks. Sensors 2019, 9, 6411- 6434.
3. Gong, P. Wireless Sensor Network as a New Ground Remote Sensing Technology for Environmental Monitoring. J. Remote Sens. 2017, 11, 545-551.
4. Li, X.H.; Huang, T.S.; Sun, Z.H. Embedded Environment Monitoring System Based on GPRS and SMS. J. Jilin Univ. Eng. Technol. Ed. 2017, 37, 1409-1414.
5. Ahonen, T., Virrankoski, R., Elmusrati, M., 2008. Greenhouse monitoring with wireless sensor network. In: IEEE/ASME International Conference on Mechtronic and Embedded Systems and Applications, 2008. MESA 2008. IEEE, pp. 403– 408.
6. Aiello, G., Giovino, I., Vallone, M., Catania, P., Argento, A., 2018. A decision support system based on multisensor data fusion for sustainable greenhouse management. J. Cleaner Prod. 172, 4057–4065.