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WSN Based Intelligent Control System for Sericulture

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***Abstract*: Sericulture, or silk farming, is the cultivation of silkworms to produce silk. Temperature, Humidity and Light intensity are very important parameters in the progression of silkworms, suitable encouraging must be done according to requisites in every stage. Environmental variations assume as an important part in the growth and development of silkworm. IoT is recent paradigm that has a variety of each and every object to sense and communicate through the internet by wireless smart mobile with each other. The auto controlled actuators like exhaust fan, heater and sprinkler maintain the temperature and humidity of the system within the threshold levels. The speciality of this model comprises of a system which can observe temperature, humidity and light intensity through sensors. If any variations in the parameters, NodeMCU directly send notification to the user mobile application through Wi-Fi using the internet connection. The aim of this model is to obtain the silk, without compromising the quantity and quality. The system permits for scheduled programming through Arduino IDE software in such a way to maintain the required environmental conditions.**

***Keywords*: WSN, Sericulture**

1. Introduction

Sericulture, the production of raw silk by means of raising caterpillars (*Bombyx mori*). Silkworms were first discovered by the Chinese around 2700 BC and for many centuries. Sericulture begins with knowing which silkworm will yield high quality silk that is both strong and naturally lustrous. Bombyx Mori is the most widely used species. In fact, there is evidence to suggest that Bombyx Mori was the species originally discovered by Chinese during the Neolithic age, when silk was first cultivated. The art and technology of raising silkworm for the production is called sericulture, that comprises with cultivation of mulberry, silk worm rearing and post cocoon activities leading to production of silk yarn.

Silk is known as "QUEEN OF TEXTILE" and naturally produced animal fiber. Sericulture is an agro based cottage industry, the production of silk is very time taking as well as dedicated and difficult method. Silkworm mainly deals with the preparation of silk by nurturing the silkworms. The foremost cause is recognized for enormous difference is absence mechanization in the sericulture field. The seasonal changes disturb the environmental changes in the silkworm rearing house, which affects the weight of cocoon and shell ratio as well as cocoon quality. The quality of silk is affected due to the environmental changes in the silkworm rearing house. By controlling the environmental factors such as temperature, humidity and light intensity throughout the lifespan of silkworm without compromising the quality of silk.

2. Literature review

- K. Rahmathulla, this paper details the influence of temperature, humidity, air and light on the growth and development of silkworm. The day to day or seasonal changes of the environmental parameters affect the output of the sericulture process such as cocoon weight and quality of silk.
- It discusses the optimum conditions for the environmental parameters for the higher productivity in sericulture.
- It also studies about the growth, feed and reproductive potentials. The study highlights the care to be taken during silkworm spinning and the temperature, humidity influence on post cocoon parameters of silkworm.
- M. A. Dixit, designed and developed an economical model which constitute a data acquisition subsystem which measures the physical conditions in the zone.
- This model has intelligent controller and actuator facility, where the controller directs the abiotic data to actuator sub system and it achieve the corrective measures in the zone based implementation.
- Divya Darshini B designed and developed an real time monitoring model which employs a digital image processing technology. It has a disinfection actuating systems which observe the different stages in the lifecycle of silkworm.
- This developed prototype features real time data is collected using 6LOWPAN and protocols like the constrained application protocol(COAP) and routing protocol for low power and lossy network(RPL).
- Actuators like heater, exhaust fan, sprinkler maintain the temperature and humidity of the system within the predetermined threshold levels.

- Image processing technology is used with a serial camera incorporated in the system which capture the pictures of sericulture process and analyze the status.
- Intelligent and smart WSN system can collect and process large amount of data from the beginning of the monitoring.

3. Block diagram

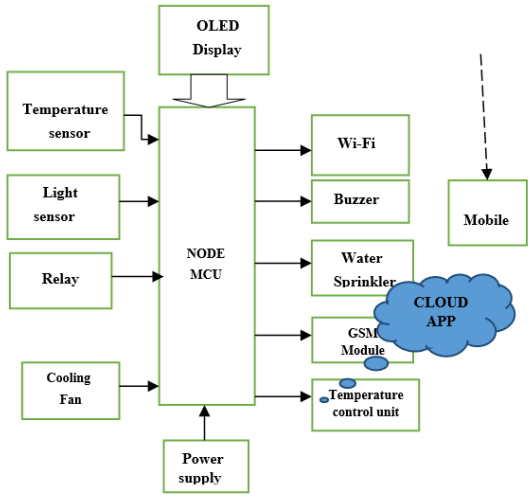

Fig.1. IoT Based block representation proposed system

4. Methodology

Microcontroller (NODEMCU) is the heart of the framework which is customized such that it will screen and control the parameters within the threshold values. There are two sensor temperature, humidity and light sensor. The DHT11 sensor measures the temperature and relative humidity which splits over a digital signal with temperature and humidity, given to NodeMCU. LDR (light dependent resistor) measure the light intensity in the rearing house. Cooler and temperature control unit (heater) maintain the temperature within the threshold values. OLED display the environmental parameters. Relay is an electrically operated switch to protect the electrical circuit from the faults. The information and condition in raising house will be sent to agriculturists mobile through the GSM.

The proposed system does the following.

- Testing and validation of sensor.
- Signal conditioning.
- Receiving signal with the help of Internet of things(IoT).
- Based on sensor signal analyze the situation and provide appropriate control signal to meet required condition.
- Interfacing sensors to microcontroller to achieve the desired result.

5. Conclusion

The “WSN Based Intelligent Control System for Sericulture" gives automation and guided environment in sericulture advances, this venture gives mechanization and supervisory control in sericulture cultivates by employing NodeMCU and IoT technology based invention. This model facilities and controls the natural variables like temperature, intensity and light power along with the food feeder and solution sprays. Required edge values for parameters like temperature, relative humidity and light intensity can be stable based on the environmental circumstances. The proposed framework is financially affordable and power effective arrangement. Implemented test of this prototype system validates that the proposed. System can work gradually to observe the environmental conditions inside the silkworm raising house. The proposed system reduces the man power and reduces the chance of errors. The model is convenient to implement and use. The current system requires continuous internet and connectivity. In future this can be overcome by using GSM module to send the notification directly on the farmer’s mobile through the SMS without using the internet connectivity.

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