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A New Technique of Automated Sericulture Based on IoT

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ABSTRACT- Seasonal variations in environmental factors have a significant impact on genotypic expressions in forms of the phenotypic outputs in silkworm crops, such as a cocoon's weights, shell's weights, & cocoon's shells ratios. Necessity for the temperature & relatives humilities controls for sustainable cocoon formation is highlight by change in the environment variables from the day-to-day and the season to the season. Effect of the temperatures & humid on the silkworm's growths & developments, as well as current findings on heat shock protein, is discussed in depth in this review study. The impact of air and light on silkworm growth is also discussed in the study. In addition, the effect of different environmental variables on the embryonic developments of the silkworm's eggs, nutrition indices of the silkworm's larvae, & the generative potentials of the silkworm moths is highlighted in this study. The researchers also discuss need for the cautions when the spinning silkworm & impacts of the temperatures & humidity on the silkworm post-cocoon the parameters. Future ideas for managing climatic conditions for a good cocoon crop were addressed in the study.

KEYWORDS- Cocoon, IoT, Sericulture, Silk, Temperature.

I. INTRODSUCTION

Sericulture refers to the practice of rearing silkworms for the purpose of producing silk. India, together with second, accounting for 15% of total production. Temperature, relative humidity, light intensity, and atmospheric air all have a role in the development of healthy silkworms, and proper nurturing should requirements. Occasional variations have an important role in the growth and development of silkworms. Sericulture is a major occupation in India's rural areas, and the techniques used by agriculturists are still outdated. There is a need to use innovation in sericulture cultivate in the future. Natural variables such as temperature, relative humidity, and light power are modelled and controlled by this model. Over the homestead, there are also food feeders and solution sprayers. It also advises agriculturists on how to keep up with the conditions on the farm and what steps to take if any conditions are broken [1-4].

This is about giving agriculturists automated control using wireless sensors, microcontrollers, and IoT. According to a study India, on the other hand, contributes only 15% of world silk production, compared to China's 85 percent. Sericulture is the science of raising silkworms for the purpose of producing silk. Silk production is a time-consuming, labor-intensive, and difficult process. Silkworms are believed to be one of the most important housetrained animals, harvesting dynamic silk-fiber in the form of cocoon by swallowing mulberry leaves during their larval stage [5-8]. The lack of automation in the sericulture area is the most obvious explanation for such a large disparity. Seasonal variations in the silk worm raising house disrupt the ecosystem, affecting cocoon weight and shell ratio, as well as cocoon quality. Sericulture is the science of raising silkworms for the purpose of producing silk. Silk production is a time-consuming, labor-intensive, and difficult process [9-12].

According to research, environmental factors have a significant role in silk harvesting. Controlling a variety of environmental variables such as temperature, humidity, and light intensity during the silkworm's life cycle promises improved silk quality and quantity.

II. LITERATURE REVIEW

G. R. Poornima et al. presented that sericulture is the study of the raising of silk worms and the manufacture of silk. Sericulture provides the majority of rural subsistence in India, and it has been the foundation for economic, social, political, and intellectual progress and upliftment since then. Because of its glistening sheen, softness, elegance, durability, and tensile qualities, silk is known as the queen of fabrics. Bombyx mori is the most frequently utilized silkworm species, despite the fact that there are numerous commercial species. Silkworm is an important domesticated bug that consumes mulberry leaves during its larval stage to generate rich silk thread in the shape of cocoon. However, the silk worm must go through several stages throughout its transition from larva to silk. The farmer's main problem in each phase is silkworm surveillance. As a result, we suggested a way for automating sericulture systems using an Arduino board in this study. It is concerned with the control of climatic conditions in the farm, such as temperature and humidity [13].

B. Divya Darshini et al. Sericulture is the process of rearing silkworms for the purpose of producing silk. India is the world's second-largest silk producer. Sericulture is at the heart of India's social, economic, cultural, and political development. Temperature and humidity have a critical role in the growth of healthy silkworms at all stages, particularly during larval development. Disinfection is one of the most important factors to consider while raising healthy and

successful silkworms. And the manufacture of silk. Sericulture provides the majority of rural subsistence in India, and it has been the foundation for economic, social, political, and intellectual progress and upliftment since then. Because of its glistening sheen, softness, elegance, durability, and tensile qualities, silk is known as the queen of fabrics. Bombyx mori is the most frequently utilized silkworm species, despite the fact that there are numerous commercial species. Silkworm is an important domesticated bug that consumes mulberry leaves during its larval stage to generate rich silk thread in the shape of cocoon. However, the silk worm must go through several stages throughout its transition from larva to silk. Contiki OS is used to develop and implement the whole system, which regulates the air conditions inside the sericulture system according to the needs at each step of the sericulture life cycle [14].

M.C. Ramya et al. discussed more than half of the world's sericulture production is produced in India. Modern Sericulture procedures necessitate a precise categorization of soil that is suited increasing Mulberry crop productivity significantly. The absence of automation in the sericulture process is to blame for the low amount of silk produced. This technique is designed to eliminate the challenges that farmers encounter when operating a manual sericulture farm. The technology combines the use of a microcontroller and a GSM module to provide the farm and the user with automated control functions. For this suggested method, automation in sericulture is necessary to increase silk thread output and quality. By automating the silkworm raising unit, the proposed system will reduce the farmer's manual innovation. The absence of automation in the sericulture process is to blame for the low amount of silk produced. This technique is designed to eliminate the challenges that farmers encounter when operating a manual sericulture farm. The technology combines the use of a microcontroller and a GSM module to provide the farm and the user with automated control functions. For this suggested method, automation in sericulture is necessary to increase silk thread output and quality. By automating the silkworm raising unit, the proposed system will reduce the farmer's manual innovation. [15].

Zhiqiange Zhu et al. discussed a high-speed automated sorting system for living silkworm chrysalis was created using near infrared spectroscopy in conjunction with multivariate analysis. The variables impacting sex discrimination, such as pupae varieties and positions, were first investigated using static spectra. Second, dynamic spectra modelling was studied. The noise in dynamic spectra is significantly higher than in technique is designed to eliminate the challenges that farmers encounter when operating a manual sericulture farm. The technology combines the use of a microcontroller and a GSM module to provide the farm and the user with automated control functions. For this suggested method, automation in sericulture is necessary to increase silk thread output and quality. By automating the silkworm raising unit, the proposed system will reduce the farmer's manual innovation. The absence of automation in the sericulture process is to blame for the low amount of silk produced. This technique is designed to eliminate the challenges that farmers encounter when operating a manual sericulture farm. Finally, using the high-speed sorting apparatus, several kinds of live with a mistake rate of less than 2.5 percent. The equipment has been successfully used to sort around 1.2 tons of live silkworm pupae each day in various seasons and places, and it has the potential to have a substantial impact on the development of contemporary sericulture [16].

P.P. Prasobhkumar et al. discussed the creation of a unique quality evaluation system for Bombyx mori L. cocoons is described in this work, which has considerable labor-friendliness, accuracy, speed, and running cost benefits over the traditional manual technique (subjective, examines just a few sample cocoons, poses health dangers). A conditioned lighting unit, an image acquisition and processing unit, and a smart camera were all part of this system. Quantitative measurements of size, shape, and stain color were accomplished using image processing algorithms (morphological operation, image enhancement, and ellipse fitting), and each cocoon was automatically classified into four defective categories and good cocoons using image processing algorithms (morphological operation, image enhancement, and ellipse fitting). On the camera screen, the system not only highlighted each category, but also provided statistical data such as the number of cocoons in each category and the total defect percentage. Additionally, the system was set up to notify the user when the defect percentage crossed a certain level. The system was able to evaluate 96 cocoons per second in a single frame, according to the results. On a sample of 137 cocoons, it was 100 percent accurate. The cocoons were rolled along a hill at an eight-rotation-per-second place to expose the whole surface, while the system collected and analyzed video of the entire surface. When collected in a single picture, this technique allowed for the same level of quality evaluation and counting accuracy as manually exposing the faulty regions to the field of vision [17].

Research Questions

- How to lessen the physical discovery of farmers, automating processes of the silkworms rearing units?
- Components used develop an automated sericulture based on IoT?

III. METHODOLOGY

A. Design

The suggested conditions in real time. Sensors, a microcontroller, and actuators make up the system. The sensors circuit is made up of four analogue sensors: temperature, humidity, light, and fire, as well as a digital sensor. The controller is designed to have manage the system, and we can send data to the cloud using think talk IOT. Figure 1 shows the block diagram and the interconnection of the components.

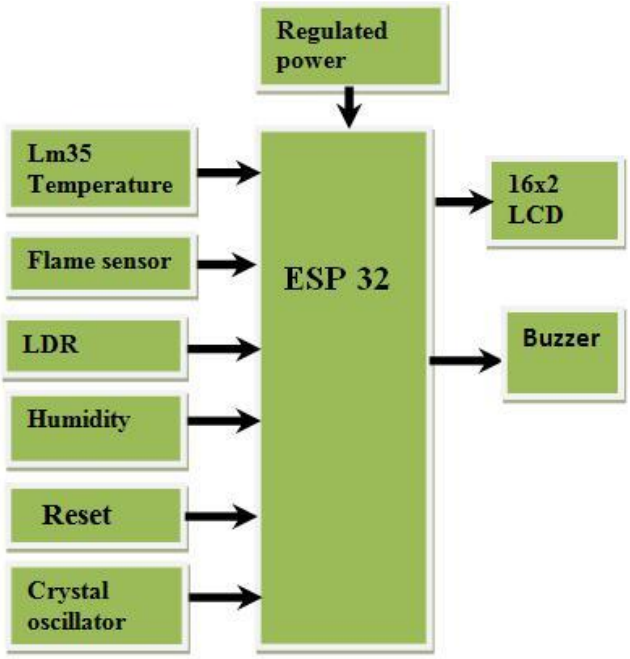

Figure 1: Illustrates the block diagram and the interconnection of the components of proposed system

B. Instruments

To Code is developed using C software and is written in C language which is an object oriented programing language and is executed on Keil Software. Keil Software is used to convert the programing language into assembly language. The developed code is then burned into the microcontroller.

1) Microcontroller

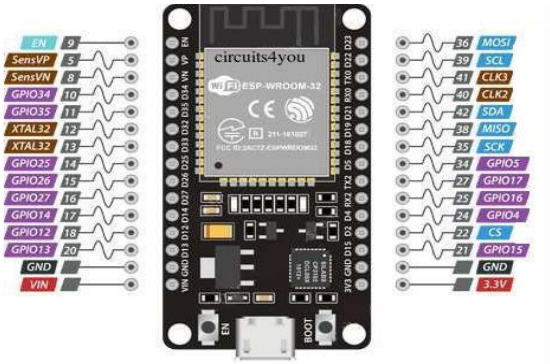

Figure 2: Illustrates the pin diagram of the of the ESP 32 microcontroller [18]

The whole model's Espressif System (ESP) 32 brain. Temperature, humidity, and light dependent resistor (LDR) sensors all provide commands to it. After receiving the data, the controller compares it to the threshold values recorded in the cloud over the internet and maintains the needed silkworm environmental conditions. The pin diagram for the ESP 32 microcontroller is shown in Figure 2.

2) Temperature Sensor

The LM35 family of temperature sensors are precision integrated circuits with a proportional output in Celsius. It is powered by a single source of electricity. The LM35 is a type of temperature sensor that may be used to detect temperature with an electrical output that is proportional to the temperature in degrees Celsius. It is capable of measuring temperature more accurately than a thermistor.

3) Light Dependent Resistor (LDR)

Resistance decreases with increase in the falling light strengths. Also known as photodetector & built up of a high resistive semiconductors.

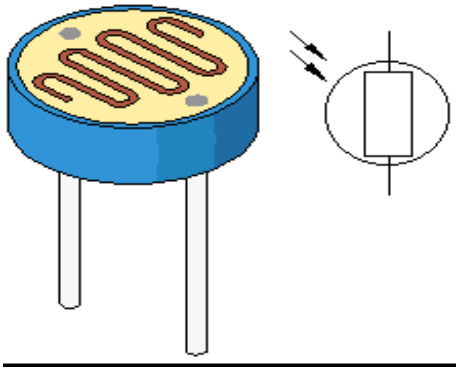

Figure 3: Illustrates schematic diagram and the circuit symbol of LDR [19]

4) Moisture Sensor

Moisture sensor also known as humidity sensor are day by day gaining significances in the miscellaneous field for the measurements & the control technologies.

Figure 4: Represents the humidity sensor used in the proposed system of automated sericulture [20]

IV. RESULT AND DISCUSSION

According to data from the Central Silk Board, India ranks second in the world for overall silk production, although only 15% of it is produced in India, with the remaining 85% coming from China. The absence of automation in the sericulture process is to blame for the low amount of silk produced. This technique is designed to eliminate the challenges that farmers encounter when operating a manual sericulture farm. The technology combines the use of a microcontroller and a GSM module to provide the farm and the user with automated control functions. For this suggested method, automation in sericulture is necessary to increase silk thread output and quality. By automating the silkworm raising unit, the proposed system will reduce the farmer's

manual innovation. This will also aid in the monitoring of silkworms raising units, as well as transmission information to farmers remotely. Silk output will rise under the suggested system.

Advantages of the System

- It suggests a cost-effective and power-efficient arrangement.
- To track & regulate humidity, temperature, & intensity of light present in the silkworms raising house, an efficient wireless sensor network with IOT technology is used.
- The suggested method saves time and money by reducing manpower and lowering the risk of mistakes.

V. CONCLUSION AND IMPLICATIONS

Using microcontroller and WIFI-based technology, this project provides automation and supervisory control in sericulture cultivates. The absence of automation in the sericulture process is to blame for the low amount of silk produced. This technique is designed to eliminate the challenges that farmers encounter when operating a manual sericulture farm. The technology combines the use of a microcontroller and a GSM module to provide the farm and the user with automated control functions. For this suggested method, automation in sericulture is necessary to increase silk thread output and quality. By automating the silkworm raising unit, the proposed system will reduce the farmer's manual innovation. The framework is simple to work with. Broadband/Wi-Fi and the Internet of Things (IOT) are being used for correspondence and information security. Although there much research done in this field but there is potential of more research and advancement of the system in future. The value of the sensor is monitored in the current system, and we only know climatic conditions, so we can control atmospheric conditions by implementing an operating section from the cloud.

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