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IoT Based Automated Sericulture System

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Abstract: ***Sericulture denotes to the rearing of silkworm to produce silk. Parameters like Temperature, Humidity and Light intensity are the important factors in the progression of silkworms and suitable encouraging must to be done according to the requisites in every stage. Environmental variations assume as the important part in the growth and development of silkworm. Sericulture is the important occupation in India and the techniques used by the agriculturists are yet outdated. Hereafter there is the need of developing modernization in sericulture cultivate. This endeavor gives a thought of providing automation in sericulture cultivate. The model goals at making use of developing technology that is IOT and smart Sericulture using automation. Observing environmental parameters of the silkworm rearing house is the most important aspect to improve vintage of the silk. The specialty of this model comprises enhancement of a system which can observe temperature, humidity, light power through sensors using NodeMCU and in case of any variations in the parameters send a notification on the user mobile application using internet connection. This system permits for data assessment and scheduling to be programmed through the arduino IDE software.***

I. INTRODUCTION

India rank 2nd globally in the field of silk production says the in the report by central silk board. On the other hand, only 15% of global silk production is contributed by India as compared to china which produces 85% of silk. Sericulture is the field in which production of silk is done by raising the silkworm. Sericulture mainly deals with the preparation of silk by nurturing the silkworms.

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Production of silk is very time taking as well as dedicate and difficult method. Silkworm is considered as one of the utmost essential housetrained creatures that harvest dynamic silk-fiber in the shape of cocoon by ingesting mulberry leaves throughout the initial that is larval stage. The foremost cause that can be recognized for enormous difference is absence of mechanization in the sericulture department. The seasonal changes disturb the environmental change in the silk worm rearing house, which affects the weight of cocoon and shell ratio, as well as cocoon quality.

Hence, the quality of silk is affected due to the environmental change in the silkworm rearing house. To improve the production and quality of silk thread, usage of automation in sericulture is suggested in this paper. Research shows that the environmental parameters perform a vigorous part in the harvest of silk. By controlling the numerous environmental factors such as temperature, humidity, and light intensity throughout the lifespan of the silk-worm promises enhancement in the silk quality and quantity. It has been researched that each moult that is growth period of silk-worm necessitates a particular set of standards of environmental factors to reach an optimal income of silk.

II. LITERATURE SURVEY

The current technique and one of the oldest methods in sericulture is the labor-intensive way of checking the factors. In this technique the agriculturalists they themselves authenticate each and every factors and compute the required values. It emphases on emerging devices and tools to achieve, display and aware the operators via the benefits of a wireless sensor network scheme. It goals at building sericulture smart by applying automation and IoT technologies. The cloud computing devices that can make a whole computing system from sensors to tools, that observe data from sericulture field and precisely load the records into the sources. This system suggests an innovative methodology for smart farming by connecting a smart sensing devices and smart controlling system through wireless communication technology. It recommends a low cost and efficient wireless sensor network with IoT technology to monitor and control the temperature, humidity and light intensity present in silkworm rearing house.

III. PROPOSED SYSTEM

The proposed system is implemented with the help of both software and hardware tools, that will carefully observe as well as control the variations in the environmental factors of silkworm raising house on the consistent basis.

Below fig.1 shows the block diagram representation of the proposed system. The proposed system does the following-

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

The coding in Node MCU is done in the manner, that it will have the edge information and the capacity to watch and control the model.

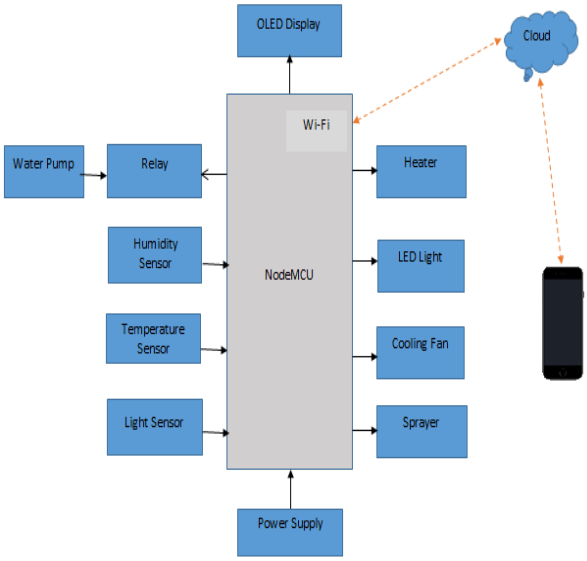

Fig.1. IoT Based Block Representation Proposed System

As shown in the above figure 1, the system contains sensors, NodeMCU and actuators. The system contains of three sensors that is temperature, humidity and light. NodeMCU is programmed and has capacity to monitor and control the model with the provided threshold values. The scheme contains both the software part and hardware apparatuses. The main purpose of the program design is to mechanize the action of the controller. Printed circuit board is loaded with the code via selected ports to achieve the required task. It is easiest way to control the whole procedure based on the circumstances given in the code.

A. Hardware Implementation

1. *Microcontroller*

The NodeMCU is the brain of the whole model. The microcontroller accepts the instructions from temperature, humidity and LDR sensor. After receiving the sensor data the controller will compare with the threshold values which is saved in the cloud, with the help of internet and maintains the require environmental parameters by the silkworm.

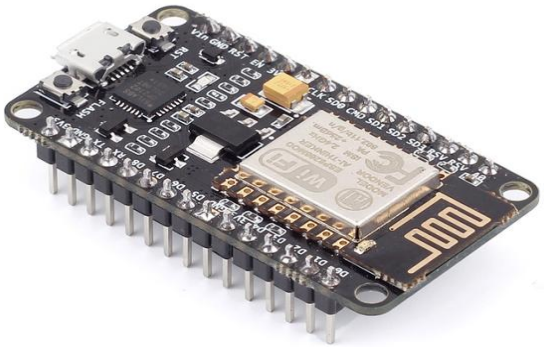

Fig.2. NodeMCU

2. Temperature sensor and Humidity Sensor

The DHT11 is a simple, extreme low in cost digital humidity and temperature sensor. This sensor is used here to sense the humidity and temperature of the silkworm rearing house and to provide digital signal on the data pin. With the help of the sensor data the controller will monitor and control the humidity and temper

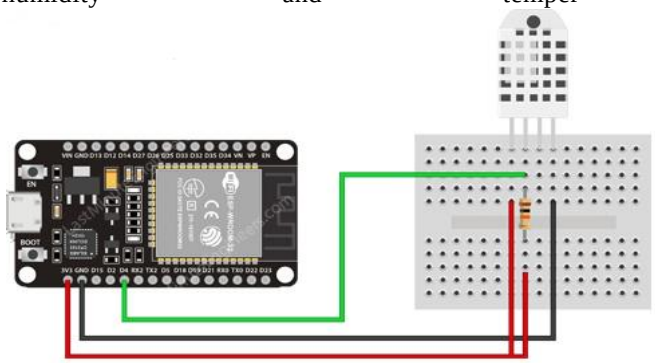

Fig.3. DHT-11 sensor

3. *LDR Sensor*

LDR is used as light sensor. LDR sensor is used here for measuring the light intensity of the silkworm rearing house. Based on the required light intensity the LED is turned on or off.

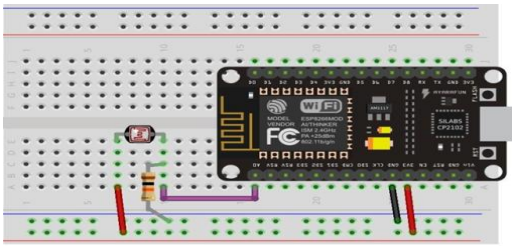

Fig.4. LDR sensor

4. *OLED (Organic Light Emitting Diodes)*

OLED is a display that does not need backlight and are thinner. Here we have used OLED to display the environmental condition of the silk-worm raising house. The OLED will display the present temperature and humidity which will be helpful to the operator.

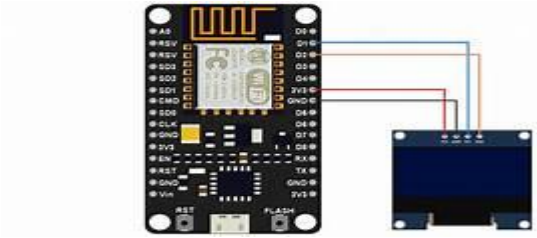

Fig. 5. OLED interface to Node MCU

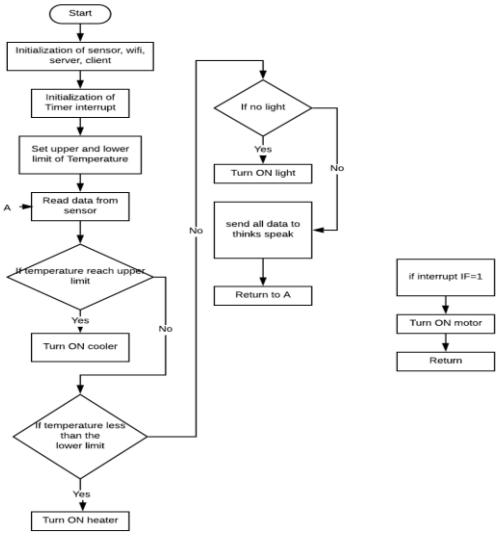

Fig.6.Flow Chart

The C++ program is written in arduino integrated development environment (IDE) in such way to maintain the required environmental conditions. If temperature is below threshold value ON the heater and if the temperature is above the threshold value turn ON the cooler.

IV. RESULTS AND DISCUSSION

In the proposed system, there is an analyzing of the execution parameters of Silkworm rearing house such as temperature, humidity and light intensity using IoT. The variation in the parameters such as temperature and humidity of silk worm rearing house is sensed by the sensors and is shown on OLED and is sent in the agriculturist mobile application and planned important changes will be completed. In case if the temperature increases then the fan will be turned on and if it decreases the heater will be turned on, if light intensity is low then light will on. The resultant outputs are shown in Fig 7 and 8. Figure below shows the variation in temperature, this can be seen in the mobile using application by the farmer.

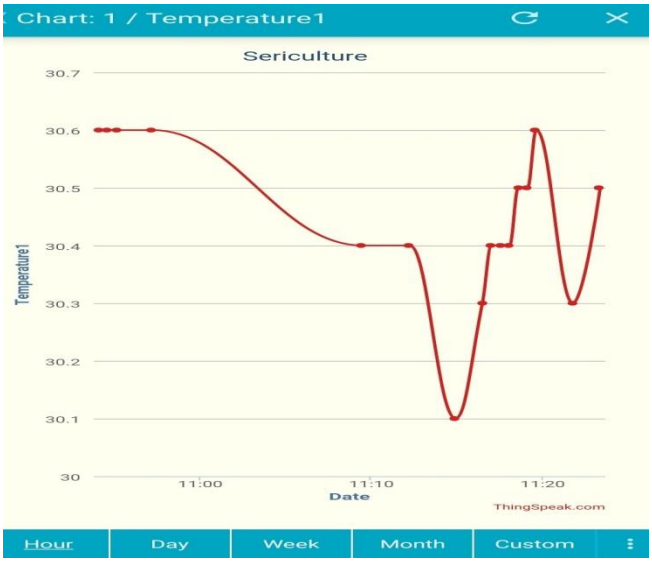

Fig.8. Temperature Variation

Fig.9. Humidity Variation

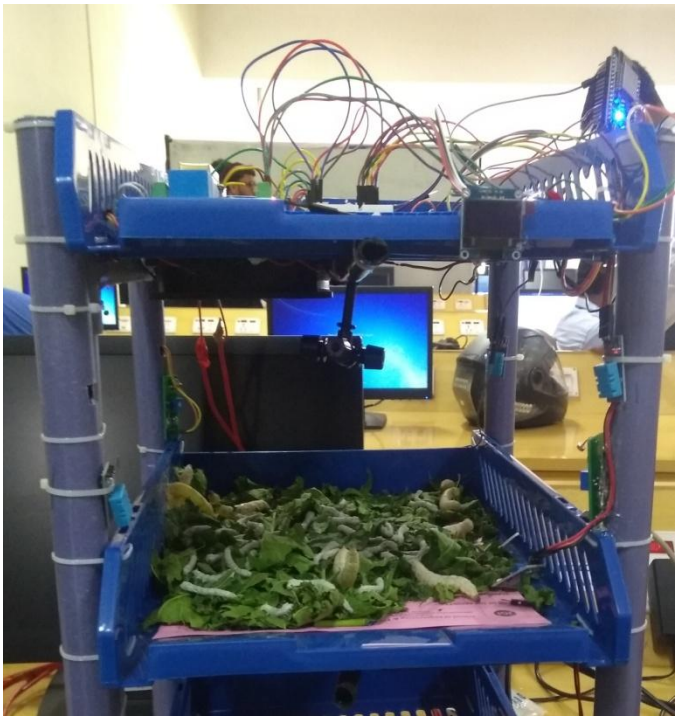

Fig.9. Final Prototype--Front View

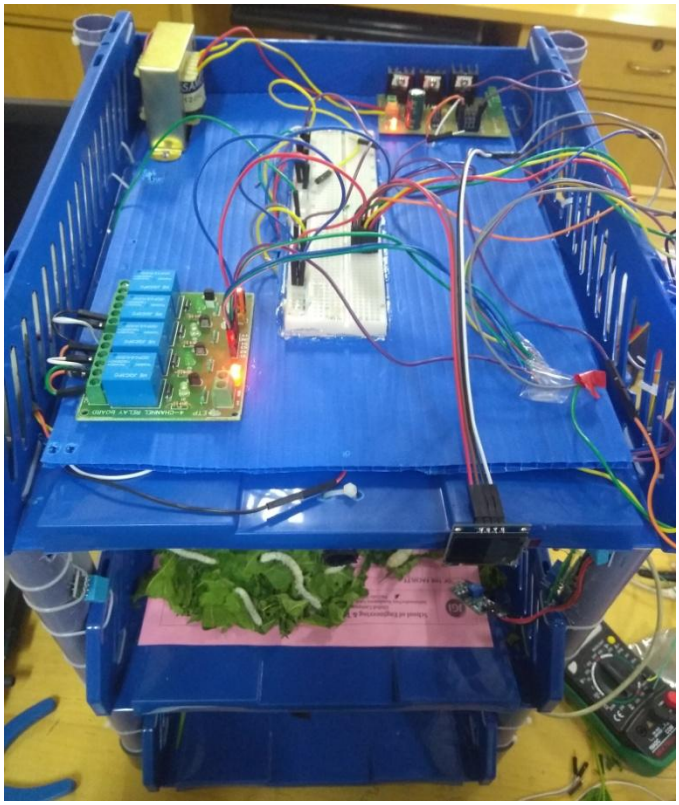

Fig.9.Final Prototype-Top View

V. CONCLUSION AND FUTURE SCOPE

This "IoT Based Automated Sericulture System" gives automation and guided control in sericulture advances by employing NodeMCU and IoT technology based invention. The proposed system facilities and conduct the environmental conditions to be reserved inside the silkworm rearing house. Required edge values for parameters like temperature, relative humidity and light intensity can be stable based on the environmental circumstances. On the basis of requirement fan, light, and heater is turned on and off based on required environmental condition. The planned system is financially affordable and power effective organization. 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 easy to implement and use.

The current system requires continuous internet connectivity. In Future this can be overcome by using GSM module to send the notification directly on the framer's mobile through the SMS without using the internet connectivity.

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