International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488 |

|| Volume 8, Issue 5, May 2020 ||

# Automated Smart Sericulture System Based on Image Processing Technique

Monica K V[1] , Monisha R Shetty[2], Nandini R[3], Neethu K[4], Ms.Jeevitha[5]

Final year B.E Students (UG), Department of Information Science & Engineering, The Oxford College of Engineering, Bangalore, India[1,2,3,4]

Assistant Professor, Department of Information Science & Engineering, The Oxford College of Engineering, Bangalore, India[5]

**ABSTRACT:** Sericulture is a art of rearing silk worms for silk production. India is the second largest producer of silk in the world. Sericulture is the root of social, economical ,cultural and political progress of India. Temperature and humidity plays an important role in the development of healthy silkworms in every states, especially during the development of larva. Disinfection is one of the critical parameters to be considered for healthy and successful silk worm rearing.

**KEYWORDS**: Automated smart sericulture system, Silkworm rearing , temperature, Humidity, disinfection reduced human intervention.

## I.INTRODUCTION

The Internet of Things(IoT) is a recent paradigm that has made a variety of each and every things/objects to sense, actuate and communicate through internet by recognizing itself with a unique addressing scheme and interacting wirelessly with each other to create a smart implementation.
Silkworms are stenophagous insects that are fed solely with mulberry leaves and/or silkworm chow.In the adult phase of the lifecycle, the silkworm moths do not eat or drink.There are 4 different stages namely egg, larva, pupa and moth.Sericulture activities are broadly classified into two:the agro-based sector and the industrial sector.The agro-based part involves two distinct phases of activities that is, mulberry cultivation and silkworm rearing. Silkworm rearing is differentiated into two stages:young age rearing from first and second instar.The intermediate stage will be 3rd instar and the rearing will be 4th and 5th instars which comes under late age rearing.The sensor network utilized in our smart sericulture system comprises of smart sensor nodes interfaced with temperature and humidity sensors to collect real time accurate readings inside the system. The autocontrolled actuators namely exhaust fan,heater and sprinkler maintains the temperature and humidity of the system within the threshold levels.Image processing technologies is utilized to capture the pictures of sericulture process and to analyze the status of sericulture process.Image processing is a method mainly to convert an image into digital form and to perform some operations on it, in order to get an enhanced image or to extract some useful information from it.Here the raw data from serial camera is collected and it will undergo various phases of processing.The 3 general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement and display, information extraction.

## II.PROBLEM STATEMENT

The existing systems use the controllers like microcontroller and PIC controller which maintains the parameters like temperature and humidity only.Hence without proper management of other parameters the existing systems are not very efficient in producing silk in healthier manner.

## III.PROPOSEDSYSTEM

The sensor network utilized in our smart sericulture system comprises of smart sensor nodes interfaced with temperature and humidity sensors to collect real time accurate readings inside the system. The auto controlled actuators namely, exhaust fan, heater and sprayer maintain the temperature and humidity of the system within the threshold levels. Both the temperature and humidity sensors provide and analog output. We have used three relay circuits, for the three actuation systems the switching operation enabling the actuator to operate for desired time. The sensors collect real time data are connected to the raspberrypi.

## IV. METHODOLOGY

This stage is the underlying stage in moving from issue to the course of action space. Accordingly, starting with what is obliged; diagram takes us to work towards how to full fill those requirements. System plot portrays all the critical data structure, record course of action, yield and genuine modules in the structure and their Specification is picked. This assumes an essential part on the grounds that as it will give the last yield on which it was being working. In our work we use following modules, these modules are listed below.

***Controlling water pump***

The greenhouse model is equipped with soil moisture sensor and a water pump. Based on the captured soil moisture level by the soil moisture sensor, it passes the data to raspberry pi and if the moisture level is below threshold value the water pump is triggered high so that it can supply water to the soil.The water pump is connected with the relay so that the raspberry pi can provide instructions to the water pump that needs to be switched on/off.The water pump is fitted inside a water tank filled withwater.

***Controlling window***

The greenhouse has window inside it. The window is fitted with Servo Motor so that when the window is need to be open, the Servo Motors get the instruction to rotate in particular angle and when it has to be closed,the servo motor rotates in anti-clockwise direction. The humidity sensor is connected with the raspberry pi. When the humidity level reaches the threshold value the microcontroller triggers the servo motor to rotate so that the window opens up and when the humidity level goes down to normal level the servo motor rotates in anti-clockwise direction to close the window.

***Controlling upper lid andfan***

The upper lid of the greenhouse is fitted with the servo motors and it can be open or closed based on the requirement. Controlling the upper lid is based on the in house temperature the temperature sensor is fitted with the raspberry board and the LDR sensor is also connected with the raspberry pi board as well. The LDR sensor detects the amount of light and the temperature sensor senses the in house temperature.When the temperature reaches its threshold level, the microcontroller checks the input from the LDR sensors and if there is enough light then the upper lid of the greenhouse opens up.To open up, the servo motor rotates in clockwise direction and based on the delay the servo motor is stopped.If there is no enough light present inside the greenhouse we consider it as an night time and the fan is triggered on so that it can maintain the temperature.The servo motor as well as the fan operates with Ac current so both the devices are connected with arelay.

***Controlling exhaust fan***

The greenhouse is fitted with an mq9 sensor that can sense the carbon monoxide level. Inside the Greenhouse sensor is connected with the raspberry pi.The sensor operates at 5V, if the gas level reaches the threshold level, it triggers the exhaust fan so that the unwanted gas can go out of the greenhouse. The exhaust fan operates at Ac current circuit so it is connected with relay.

***Accessing data***

Raspberry pi can send the data to the tomcat server. User can check the details using his/her android based app.

## V.SYSTEM ARCHITECTURE

The architectural configuration procedure is concerned with building up a fundamental basic system for a framework. It includes recognizing the real parts of the framework and interchanges between these segments. The beginning configuration procedure of recognizing these subsystems and building up a structure for subsystem control and correspondence is called construction modeling outline and the yield of this outline procedure is a portrayal of the product structural planning. The proposed architecture for this system is given below. It shows the way this system is designed and brief working of the system.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488 |

|| Volume 8, Issue 5, May 2020 ||

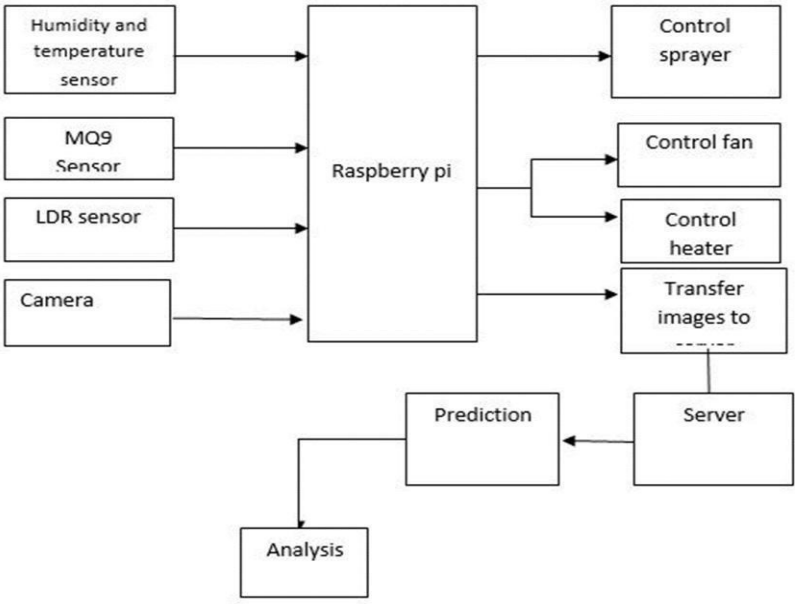



**Fig 1: System Architecture**

The Step by step process of the system;

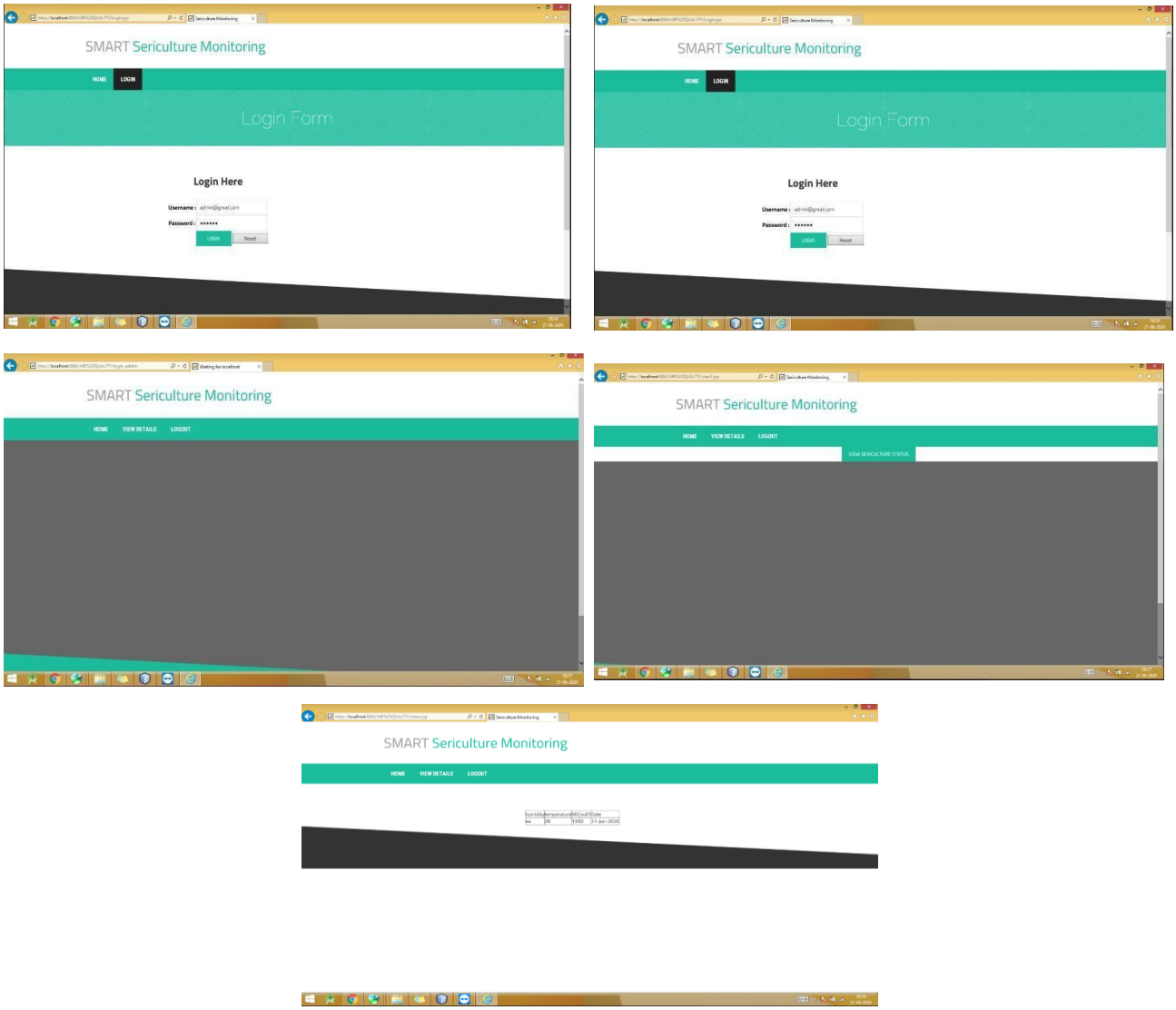
1. Humidity and temperature sensor, MQ9 sensor, LDR sensor and camera are connected to raspberry piboard.
2. Humidity and temperature sensor captures temperature and humidity level in the greenhouse model,MQ9 sensor captures the amount of carbon monoxide level, LDR sensor captures the amount of light inside the model and camera captures the videos and pictures of silkworm and all these data are sent to raspberry pi and is stored on a server to take necessary action based on obtaineddata.
3. When the moisture level captured by soil moisture sensor present in the model is below a threshold value,the data is passed to the raspberry pi which triggers the water pump to spray water using a controlsprayer.
4. When the amount of carbon monoxide level increases a threshold value then the exhaust fan is triggered on so that it can maintain the inhousetemperature.
5. When the temperature and humidity reaches a threshold value the controlling lid and window is triggered to open up to maintain the parameters in a normal level.
6. The images and videos captured by raspberry pi camera are sent to the server for comparing and then predicting if it's a healthier or unhealthier silkworm.

## VI. DESIGN CONSIDERATIONS

### Software Requirements

1. Operating system : Windows 7/8
2. JDK1.8
3. AndroidSDK
4. IDE: NetBeans, Arduino,python 3.7
5. Data Base:MYSQL
6. Server: Apache Tomcat Server7.0
7. Programming Language : Java,C

Some snapshots of our Web Application are:




**Power Supply:** Control supply is a reference to a wellspring of electrical compel. A contraption or system that provisions electrical or diverse sorts of essentialness to a yield load or assembling of weights is known as constrain supply unit or PSU. The term is most generally associated with electrical essentialness supplies, less much of the time to mechanical ones, and once in a while to others. This power supply segment is required to change over AC flag to DC flag furthermore to decrease the plenitude of the flag. The available voltage motion from the mains is 230V/50Hz which is an AC voltage, yet the required is DC voltage (no repeat) with the sufficiency of +5V and +12V for various applications.

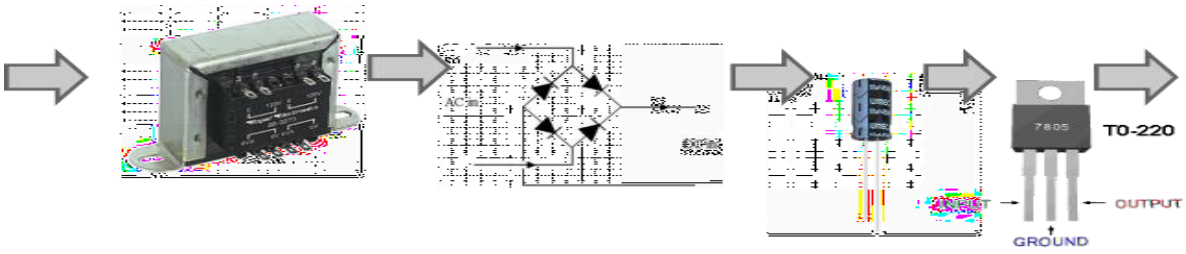



**Fig 2: Power Supply**

**DHT 11 :** This DHT11 Temperature and Humidity Sensor features a calibrated digital signal output with the temperature and humidity sensor capability. It is integrated with a high-performance 8-bit microcontroller. Its technology ensures the high reliability and excellent long-term stability. This sensor includes a resistive element and a sensor for wet NTC temperature measuring devices. It has excellent quality, fast response, anti-interference ability and high performance.

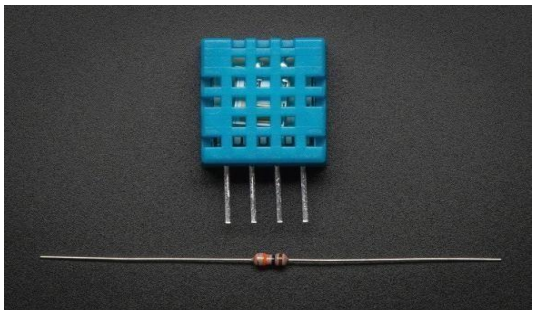


**Fig 3: DHT 11**

**Servo Motor** :A **servo motor** is an electrical device which can push or rotate an object with great precision. If you want to rotate and object at some specific angles or distance, then you use servo motor. It is just made up of simple motor which run through **servo mechanism**. If motor used is DC powered then it is called DC servo motor, and if it is AC powered motor then it is called AC servo motor. We can get a very high torque servo motor in a small and light weight packages. Due to these features they are being used in many applications like toy car, RC helicopters and planes, Robotics, Machines etc.


**Fig 4: Servo Motor**

**Arduino Concepts :** An Arduino is an open-source microcontroller development board. In plain English, you can use the Arduino to read sensors and control things like motors and lights. This allows you to upload programs to this board which can then interact with things in the real world. With this, you can make devices which respond and react to the world at large.An Arduino board is a one type of microcontroller basedkit.

The pin configuration of the Arduino Uno board is shown in the below. It consists of 14- digital i/o pins. Wherein 6 pins are used as pulse width modulation o/ps and 6 analog i/ps, a USB connection, a power jack, a 16MHz crystal oscillator, a reset button, and an ICSP header. Arduino board can be powered either from the personal computer through a USB or external source like a battery or an adaptor. This board can operate with an external supply of 7- 12V by giving voltage reference through the IORef pin or through the pinVin..


**Fig 5: Arduino**

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488 |

|| Volume 8, Issue 5, May 2020 ||

**Raspberry bi :** The Raspberry Pi device looks like a motherboard,with the mounted chips and ports exposed (something you'd expect to see only if you opened up your computer and looked at its internal boards), but it has all the components you need to connect input, output, and storage devices and startcomputing.

**Fig 6: Raspberry Pi**

**LDR sensor :** A **Light Dependent Resistor** (LDR) or a photo resistor is a device whose resistivityis a function of the incident electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells or simply photocells.They are made up of semiconductormaterials having high resistance. There are many different symbols used to indicate a **LDR**, one of the most commonly used symbol is shown in the figure below. The arrow indicates light falling onit.

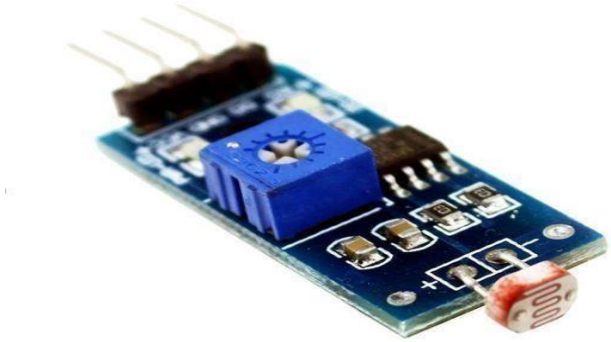


**Fig 7: LDR Sensor**

**Exhaust Fan :** Main features are:

1. Starts or stops at 5V and is connected to a controller port and supports PWM speed control of fan withprogram.
2. Power suppy voltage input range : 3-6VDC
3. With LED indicator , it will light up after being switchedon.
4. Material :FR-4
5. Easy operation, it can give rise to your interest in electronic circuits and enlighten your creativethinking.

**Fig 8: Exhaust Fan**

## VI. RESULT

The result of this project mainly focuses on the effective rearing of silkworm in a healthier manner so that finally the outcome is a good quality of silk produced.Since the svm algorithm is used ,the images captured by raspberry pi camera is in rgb form which preprocessed to convert into grayscale that is computer understandable format and then it is segmented to locate the silkworm for feature extraction and then finally is classified by comparing it with the trained dataset stored in the server as healthier or unhealthier silkworm.This project also has reduced the continuous human intervention which is otherwise required,because here all enviromental parameters are properly managed and maintained.This leads to a production of better quality of silk.

**Final Prototype:**

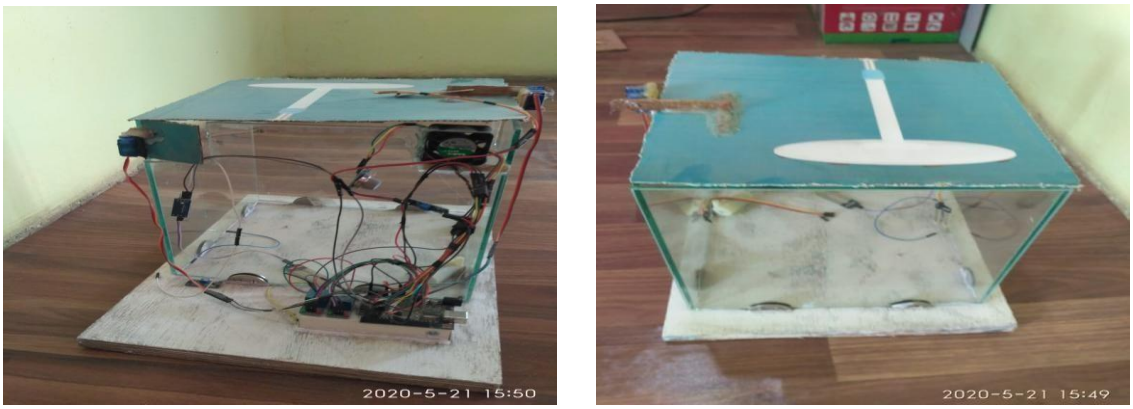



**Fig 9: Final prototype**

## VII.CONCLUSION

IoT is widely used in connecting devices and used to gather information. The system is designed to remotely monitor the greenhouse parameters such as soil moisture, temperature, and light, this information can be collected by the farmers with the help of cloud account and internet connection.There is also controlling action taken automatically that is greenhouse windows/ doors roll on/off based on the soil moisture levels. Thus, the system will help the farmers to avoid physical visit to the field, and increase the yield with the maintenance of précised parameters such as soil moisture, temperature, and light in the greenhouse with the help of IoT.
Future work is to automatically supply medicines to diseased silkworms.

## REFERENCES

1. Karuna Chandraul, Archana Singh,"An agriculture application research on cloud computing", International Journal of Current Engineering andTechnology, volume 3, No.5, pp. 2084-2087, October2010.
2. Ronald Haley, Riley Wortman, Yiannis Ampatzidis, Matthew Whiting, "An Integrated cloud-based platform for labor monitoring and data analysis in precision agriculture", IEEE 14th International Conference on Information Reuse and Integration, pp. 349-356, August2013.
3. Mistsuyoshi Hori, Eiji Kawashima, Tomihiro Yamazaki," Application of cloud Computing to agriculture and prospects in other fields", FUJITSU Sci. Tech. J., volume 46, No. 4, October2010.
4. B. K. Jha, S. K. Jha, R. Mukaharjee, D. Basak, "Development of guided SMS solution in local language for Demand-driven Access of agriculture information", 7th International Conference on Communication Systems and Networks (COMSNETS), pp. 1-5, January2015.
5. D. D. Chaudhary, S. P. Nayse, L. M. Waghmare, "Application of wireless sensor network for greenhouse parameter control in precision agriculture", International Journal of Wireless and Mobile Networks (IJWMN), volume 3, No.1, 2011.47
6. O. T. Denmead and R. H. Shaw, "Availability of soil water to plants as affected by soil moisture content and meteorological conditions", Agronomy journal,1962.
7. Ahmad Nizar Harun, Mohamed Rawidean Mohd Kassim, Ibrahim Mat, Siti Sarah Ramli, "Precision Irrigation using Wireless Sensor Network", International Conference on Smart Sensors and Application (ICSSA),2015.