

IOT based smart laboratory

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Abstract— To develop, design and implement Internet of things (IoT) based smart laboratory with respect to laboratory automation and management. IoT based smart laboratory is useful for attendance monitoring purpose, management of light and fan in the laboratory and for temperature measurement of lab. PIR sensor is that measures infrared (IR) light radiating from human and make light on and off , Finger print module for Attendance and LM35 for Temperature Monitor. This work, aims to develop a smart laboratory system in lab based on IoT and web technologies to monitor the overall activities of the lab and utilization of devices, environmental parameters via sensors, thereby providing a smart environment to lab. IoT hardware kits are design using relays, Raspberry Pi3, finger print module and sensors. The proposed work controls and monitors the devices of the lab. From the results of implementation, it is observed that the appliances in our lab are monitor and controlled.

Index Terms - PIR Sensor, LM35 Temperature sensor, Raspberry pi 3, Finger print module.

I. INTRODUCTION

In recent years automation is a trend at domestic and industrial level. Commercial building like hospitals, colleges and labs are also using automation luxuries for efficient utilization of resources. There are so many things need to be maintained in commercial labs like lighting, temperature monitoring and attendance etc. This can be centralized control and more efficient by implementing our system. Smart Laboratory is an automation system to facilitate the control of the electronic appliances located in a laboratory depending on the sensor parameter. In our system, we developed a Smart Laboratory system using a Raspberry Pi 3 , sensors, and we also maintain the attendance of student. several sensors like, fingerprint for authentication and attendance purpose, Temperature sensor to maintain temperature, and motion detectors are used to get good light management system according to availability of students in the lab. Complete system is enabled with Internet of things the access to the internet is provided by Raspberry-pi where it is acting as a gateway and uploading the information to the server also in back up data is available in mass storage device.

Smart devices of IoT can be used to replace some traditional devices so that sub-system devices will connect to

each other for better access to construct an IoT network. Human efforts are reduced when things gets automated. The need for the work is to reduce manual effort by automating laboratory resources thereby achieving a futuristic model of Laboratory using IoT and Efficient use of the laboratory resources. IoT Laboratory is equipped with devices for the monitoring status of devices like light and fan, sensors for the monitoring of environmental parameters such as temperature and monitoring the attendance of students in the lab.

II. LITERATURE SURVEY

In paper [1], proposed system design and Implement IoT Based Smart Laboratory system for monitor all activities of the lab and energy using various sensors. For designing this system they design IoT smart hardware kits. In this kit ESP8266, Arduino UNO, relays, current transformers, Raspberry Pi3 and sensors used. Also they Design Dashboard and Mobile Application for interfacing IoT smart hardware kit & MQTT broker.

In paper [2] proposed system design Smart lab using Wireless Sensor Networks. For designing this system they used two modules: 1) Ambient lighting module and 2) Security module. Passive infrared sensor (PIR) and environment sensor (ES) are used in this module. The prototype was tested based on actual data sensed by sensors and actuators are made to perform respective actions. This system design for Smart power management and security.

In paper [3] proposed system review about fingerprint Based Attendance System. Biometric technology identifies based on his/her characteristics which can be physiological or behavioral like fingerprint, face, hand vein, hand geometry, iris, retinal pattern, voice print, signature, and facial thermography. Also author discuss various attendance system like Labview, Internet of things, GSM and ZigBee, RFID and Android , ZigBee, DSP and MATLAB, Cryptography, RFID, GSM and .Net. Conclude that Biometric technology is a more reliable for authentication and security.

III. PROPOSED SYSTEM

PIR sensor is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view and provide this information to raspberry pi and status of light i.e. ON/OFF condition of light is display on GUI. LM35 sensor will measure the temperature of lab and provide this information to raspberry pi and also it will be display on GUI. Finger print module connected to raspberry pi. User can scan the finger print data in the module and attendance is store in database .Raspberry pi collect data from PIR sensor, LM35

temperature sensor and finger print module and it will display this information on GUI. Upload data on Web Page

IV.FLOWCHART

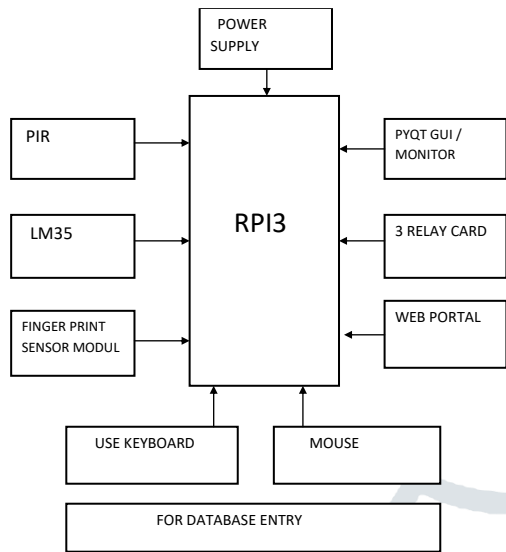
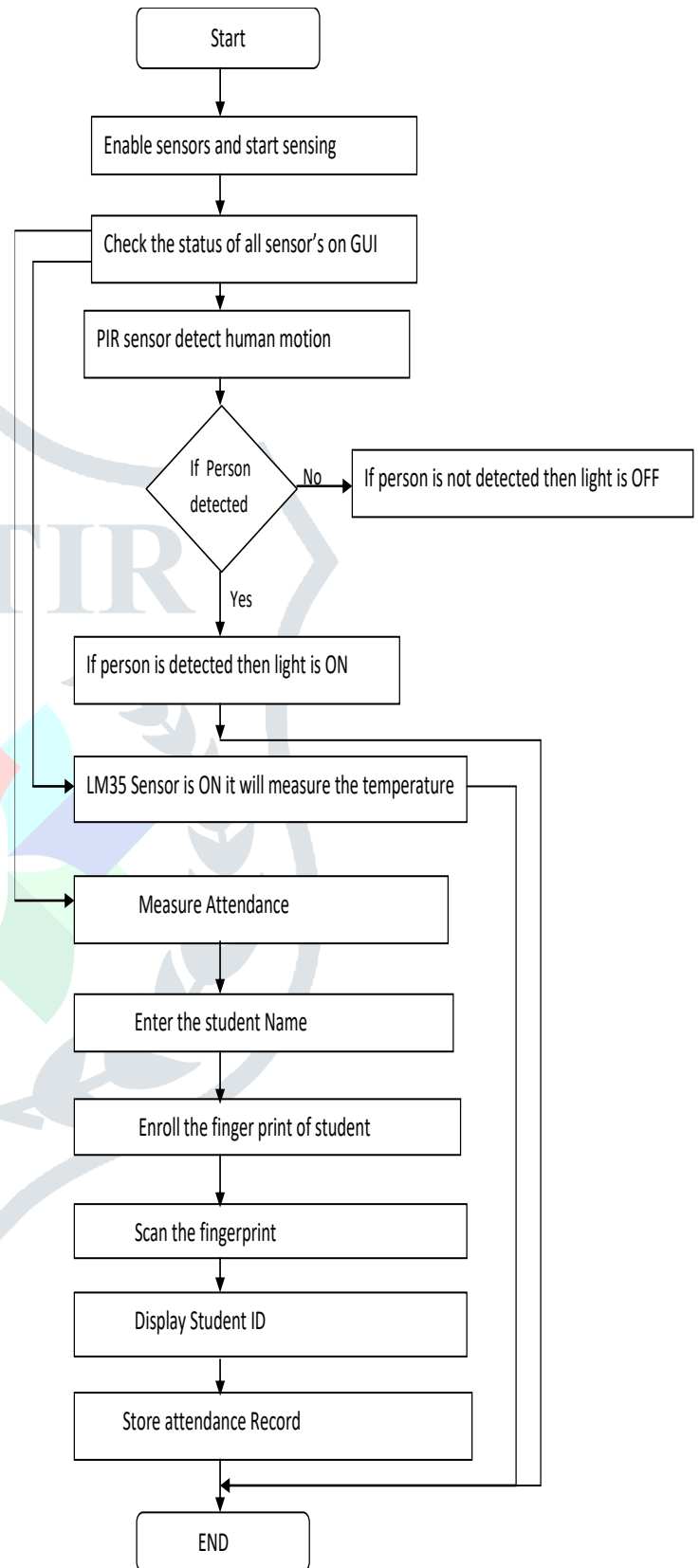
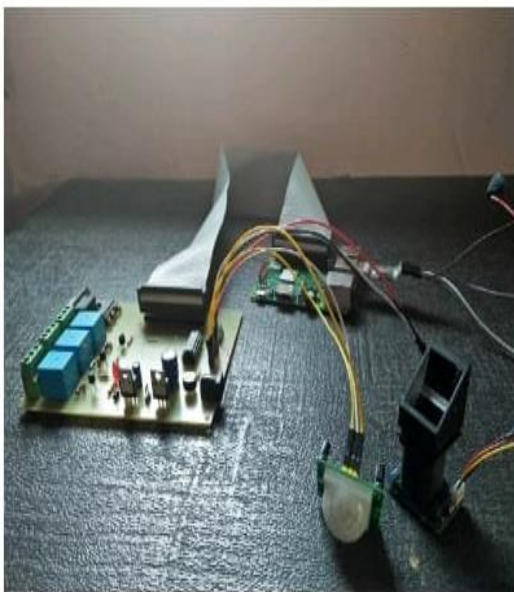


Fig.1. Proposed architecture

Actual system image:

Hardware implementation

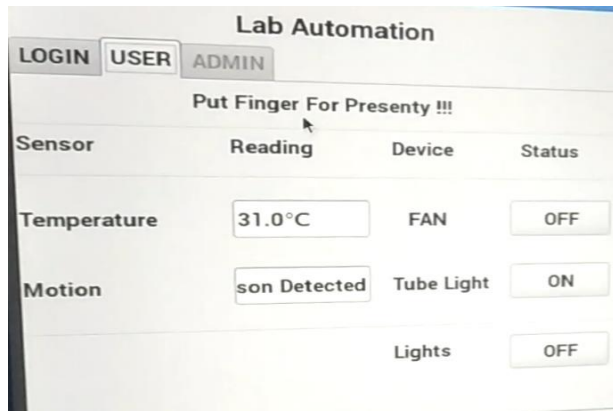


V. RESULT AND DISCUSSION

VI. CONCLUSION

1. System will display status on web portal.
2. System will automatically control the lab appliances.
3. System will keep track on the attendance of system.
4. System will record temperature and other lab parameter record.

GUI Image:



Internet of things reduces the human intervention. To implement smart laboratory system using IoT technology for monitoring and control appliances inside the lab. By introducing such a reliable system human intervention is reduced and efficient lab management is done. Power saving is also another concern which will be maintained by system itself. Lab attendance, temperature monitoring and student attendance record is stored in database and all data is stored in digital format in SD card for analysis purpose and future expansion of lab. display this information on GUI and Upload data on Web Page

VII. REFERENCE

[1] M. Poongothai, A Rajeswari, P Muthu Subramanian, "Design and Implementation of IoT Based Smart Laboratory" in 2018 5th International Conference on Industrial Engineering and Applications.

[2] Mary Cherian, Hitesh Kumar P,(June 2014) "Implementation of a Secure and Smart Lab with Wireless Sensor Network", International Journal of Science and Research, Vol.3, No.6.

[3] Hitesh Walia , Neelu Jain, "Fingerprint Based Attendance Systems-A Review", (May 2016) International Journal. of Science and Research, Vol.3.

Web Portal Output:

Lab Automation

Attendance

Roll No	Name	DN

Sensor	Reading	Device	Device Status
Temparature	33.00	Fan	ON
PIR	Hall is Empty	Tubelight 1	OFF
Sensor	0.00	Tubelight 2	ON

Time Table

Subject	Start Time	End Time	Batch	Teacher
PLC	11:57	12:26	B1	A
BCS	11:33	11:37	B2	B
Mobile Communication	11:41	11:44	B3	C
WSN	11:56	12:11	B4	D

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