

# Library Automation System

Mrs Varsaha Kshirsagar<sup>1</sup> Amruta Ambad<sup>2</sup> Shivnanda Biradar<sup>3</sup> Shubhada Ghorpade<sup>4</sup>

<sup>1,2,3,4</sup>Department of Electronics & Telecommunication Engineering

<sup>1,2,3,4</sup>RMD Sinhgad School of Engineering, Warje, Pune, Maharashtra, India

**Abstract**— Fingerprint Recognition is biometric technologies that are widely used now for authentication and security purposes. This paper is the implementation of the Fingerprint recognition for the Library automation purpose. As we know automation is the future every educational institution has to develop library automation to maintain a proper record of library students or staff for proper functioning of library. Designing a flexible and reliable authentication system is the goal so that records are maintained with ease and accuracy and develop a handy product.

**Key words:** Raspberry Pi 3, Fingerprint Module, PIR Sensor, Relay, Fan, Light

## I. INTRODUCTION

### A. Existing System

File is always lost because of human environment. Sometimes due to some human error there may be a loss off records file is always lost due to some accident like spilling of water by some member on file accidentally besides some natural disaster like foods or fires may also damage the files. Difficult to search record when there is no computerized system there is always difficulty in searching of records if the records are large in numbers.

### B. Proposed System

In this project the library automation includes student’s data base access and modifying the content. Which includes all the personal details of the student and the Fingerprint for accessing the library services. We have created a GUI i.e. Graphics User Interface which allows authority to access a student’s data base. once the all data filled the particular person is allowed in library premises. This window is developed using MATLAB The other functionalities in this smart library include the automatic switch on and off of the Fan and Lights. This all implementation is done using Raspberry Pi 3 Board and interfacing Motion Sensors and PIR sensors to it. The code for the same is done on Python software. Fingerprint module used for the project is R305. This sensor works an input to the Library Automation System.

## II. BLOCK DIAGRAM

It consists of a Python installed Raspberry pi, Biometric sensor, Motion sensor and lights. A raspberry pi board has a 1.2GHz 64-bit quad-core ARMv8 CPU, 4 USB ports, 40 GPIO pins, HDMI support, 802.11n wireless LAN, Micro SD card slot. The details of library members are stored previously in the computers database using raspberry pi.

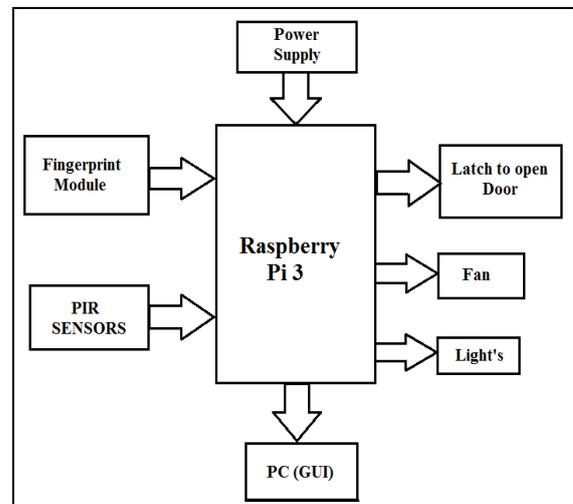


Fig. 2.1: Block Diagram

Fingerprint module is used at entrance of the library if it matches with the data in data base then only the door of the library opens. The main purpose of motion sensor is to sense when someone is in the study room. A motion sensor uses one or multiple technologies to detect movement in an area. When the person who has entered in the room motion sensor senses an intruder and will send a signal to Raspberry pi that allows turning on the light. If motion sensor does not senses an intruder then it will send a signal to raspberry pi to turn of the lights.

## III. HARDWARE

### A. Raspberry Pi

The Raspberry Pi is a series of small single board computer. The Raspberry Pi is an amazing piece of hardware because of the combination of the features of a traditional computer and an embedded device. Supporting computer operating systems like Linux and providing simple input/output lines i.e. the GPIO makes it perfect for controlling almost anything. Programming the GPIO is much easy and Sintuitive then a traditional FPGA or microprocessor.

The Raspberry Pi is perfect for adaptive technology.

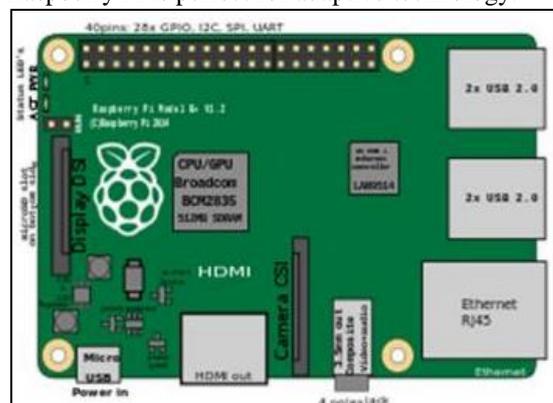


Fig. 3: 1.1 Raspberry Pi 3

### B. Fingerprint Module

Optical biometric fingerprint reader with great features this is a figure print sensor module with TTL UART interface for direct connections to microcontroller UART or to PC through MAX232 / USB-Serial adapter. The user can store the finger print data in the module and can configure it in 1:1 or 1: N mode for identifying the person.

The FP module can directly interface with 3v3 or 5v Microcontroller. A level converter (like MAX232) is required for interfacing with PC serial port. Optical biometric fingerprint reader with great features and can be embedded into a variety of end products, such as: access control, attendance, safety deposit box, car door locks.



Fig. 3.2.1: Fingerprint Module

### C. Motion Sensor

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Piezoelectric", or "IR motion" sensors.

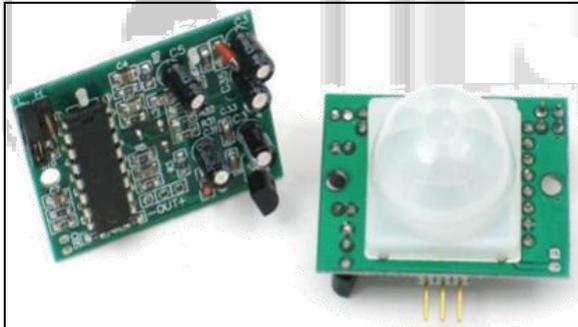


Fig. 3.3.1: PIR Sensor

PIRs are basically made of a piezoelectric sensor (which you can see above as the round metal can with a rectangular crystal in the center), which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

System process made computerized to reduce human errors to increase the efficiency the main focus of this project is to less human efforts the maintenance of the records is made efficient, as all the records are stored in the access data base through which data can be retrieved easily.

### D. Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit.

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contractor. Solid-state relay control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called protective relays.



Fig. 3.4.1: Relay

Magnetic latching relays can have either single or dual coils. On a single coil device, the relay will operate in one direction when power is applied with one polarity, and will reset when the polarity is reversed. On a dual coil device, when polarized voltage is applied to the reset coil the contacts will transition. AC controlled magnetic latch relays have single coils that employ steering diodes to differentiate between operate and reset commands. Relay is an electromagnetic switch; consist of a coil, 1 common terminal, 1 normally closed Terminal and one normally open terminal.

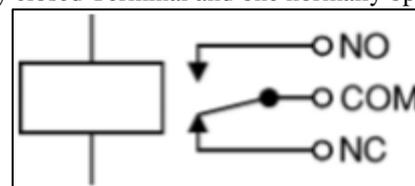


Fig. 3.4.2: Relay Circuitry

The relay's switch connections are usually labeled COM, NC and NO:

- COM = Common, always connect to this, it is the moving part of the switch
- NC = Normally Closed, COM is connected to this when the relay coil is off.
- NO = Normally Open, COM is connected to this when the relay coil is on.

### IV. CONCLUSION

After we have completed the project we are sure that the problems in the existing system would overcome the library automation system process made computerized to reduce human errors to increase the efficiency the main focus of this

project is to less human efforts the maintenance of the records is made efficient ,as all the records.

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