MINI PROJECT REPORT

ON

SMART MENTORING AND STUDENT MANAGEMENT SYSTEM

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Bachelor of Engineering

In

Electronics and Telecommunication

By

Ulhas Surose (Roll No-1832152)
Vishnu Suwarnakar (Roll No-1832154)

Ajay Wagh (Roll No-1832165)

Under the Guidance of

Prof.V. J. Nagalkar

Department of Electronics and Telecommunication Engineering,

VIDYA PRATISHTAN'S KAMALNAYAN BAJAJ INSTITUTE OF ENGINEERING AND TECHNOLOGY, BARAMATI
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Affiliated to

Savitribai Phule Pune University

Department of Electronics and Telecommunication Engineering,

VIDYA PRATISHTAN'S KAMALNAYAN BAJAJ INSTITUTE OF ENGINEERING

AND TECHNOLOGY, BARAMATI.

CERTIFICATE

This is to Certify that the Project Report Entitled

"SMART MENTORING AND STUDENT MANAGEMENT SYSTEM"

Submitted By

Ulhas Surose (Roll No-1832152)

Vishnu Suwarnkar (Roll No-1832154)

Ajay Wagh (Roll No-1832165)

is a bonafied work carried out satisfactorily by them under supervision and guidance and it is submitted towards the partial fulfillment of the requirements of Savitribai Phule Pune University, Pune for the award of degree Bachelor of Engineering (Electronics and Telecommunication) during the academic year 2018-2019.

Place: Baramati
Date:

Prof.V. J. Nagalkar   Dr.S. D. Chede
(Guide)   Head of the Department
Principal

V.P.K.B.I.E.T., Baramati

ACKNOWLEDGEMENT

ABSTRACT

We are growing in the world of technology and Mobile devices. Use of these devices in education system is common and very Important. Managing Student's attendance and various institutional services through mobile devices would give ease in proper organisation and time management. In this modern and fasten World, Institutions do require smart attendance and students service management system instead of traditional pen and paper based systems. In smart mentoring and student services system Android mobile development platform is used for managing services through mobile devices. This System consists of one Electronic Device and Two android mobile Apps. Device is controlled by Mentors through App. The device is used to take Attendance and Sync this attendance with mobile memory , Apps are used to establish a database link between Mentors and Students. One App for Students and another is for Teachers/Mentors. In mentor App we can control Attendance device to get Attendance data based on fingerprint sensor or to enroll, deenroll, Verify fingerprints. Mentor will be able to covert the Attendance data to CSV sheet. They can also browse Less Attendance reasons(in case submitted) , Students feedback, Facilities requested by student, Applications Submitted for leave, Identity card etc. and their Skill set. Mentors will also be able to issue a notice to the all the students. App for student consists of a system able to check their attendance and also request various services and provide feedback.

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List of Abbreviations

Abbreviation	Meaning
RFID	Radio Frequency Identification
OLED	Organic Light Emitting Diode
DS	Dallas Semiconductor
IIC	Inter Integrated Circuit bus
UART	Universal Asynchronous Receiver Transmitter
PCB	Printed Circuit Board
RTC	Real Time Clock
mAh	milli Ampere hour
TCP	Transmission Control Protocol

1 INTRODUCTION

Smart Mentoring and Student Management System is a System of Mobile Apps and an Electronic Device working together achieve ease in various workloads of Mentors and Teachers.This System consists of two android mobile Apps one of which is to be used by Professors and another by Students. Professors need to Authenticate with their Email id and Password before they can use the App. Then Professors will be able to add students and issue them new Account under their Account.Student need to do the same that is they must login in the App with the password provided by Professor and then he will be able to use this App. Once Logged in Professors can connect to attendance device and give various commands to the device such as enroll, start attendance etc. Professors will be able to browse less attendance reasons submitted by students and make Attendance sheet of the all attendance. They can also browse feedback , facilities requests, Applications and skills of the Students. Student App is capable to browse attendance and Submitting Attendance reasons, checking Notices issued by Mentors and other Student services.

1.1 Motivation

Managing attendance and becoming responsive to students can be a difficult task especially if the number of students under one mentor is more than 20. Being a mentor keeping note of student's skill set and listening to his/her requests is very important. Saving time used for taking attendance during lectures can also be helpful to Professors, Globalizing attendance which can be accessed by students as well is also the part of improvement in the system thus Designing a new System which can improve current situation was necessary.

1.2 Objective

To design and develop Attendance system which is accessible by students and Automatic generation of Attendance sheet is possible.
To design and develop an electronic device which is capable of taking attendance based on Bio-metrics of the students and capable of sharing attendance data with mobile Application.
To design and develop mobile Apps for Professors and Students for various services and request sharing.

1.3   Block Schematic of Proposed System
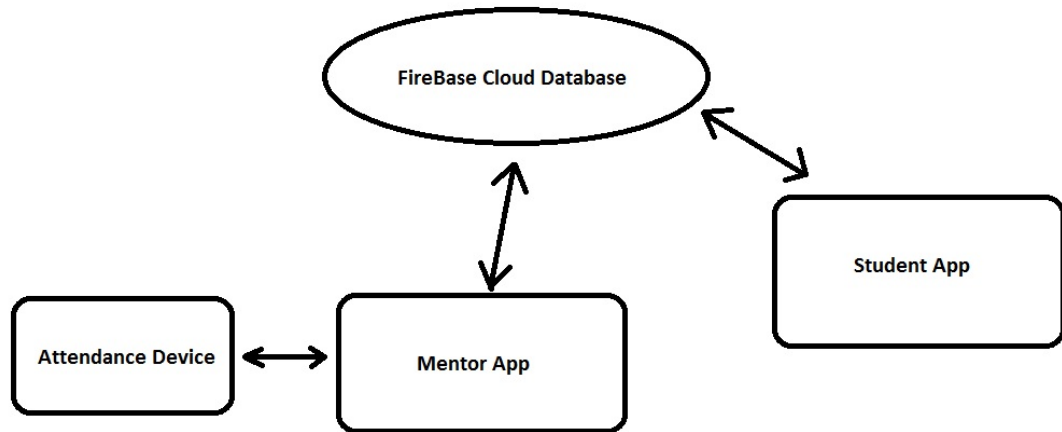
Figure 1: System Block Diagram

The above figure shows how different components of the system are connected. Bidirectional arrows indicate that these are bidirectional links , data can flow in either of the direction. features of this System :

- Attendance Management

- Notice

- Student's feedback checking

- Student's facilities requests checking

- Student's Applications checking

- Student's skillset checking

- Student's less Attendance reason checking

1.3.1   FireBase Database

Store and sync data with NoSQL cloud database. Data is synced across all clients in realtime, and remains available when app goes offline. The Firebase Realtime Database is

a cloud-hosted database. Data is stored as JSON and synchronized in realtime to every connected client. All of clients share one Realtime Database instance and automatically receive updates with the newest data. The Firebase Realtime Database lets users build rich, collaborative applications by allowing secure access to the database directly from client-side code. Data is persisted locally, and even while offline, realtime events continue to fire, giving the end user a responsive experience. When the device regains connection, the Realtime Database synchronizes the local data changes with the remote updates that occurred while the client was offline, merging any conflicts automatically.

The Realtime Database provides a flexible, expression-based rules language, called Firebase Realtime Database Security Rules, to define how your data should be structured and when data can be read from or written to. When integrated with Firebase Authentication, developers can define who has access to what data, and how they can access it.

The Realtime Database is a NoSQL database and as such has different optimizations and functionality compared to a relational database. The Realtime Database API is designed to only allow operations that can be executed quickly. This enables users to build a great realtime experience that can serve millions of users without compromising on responsiveness.
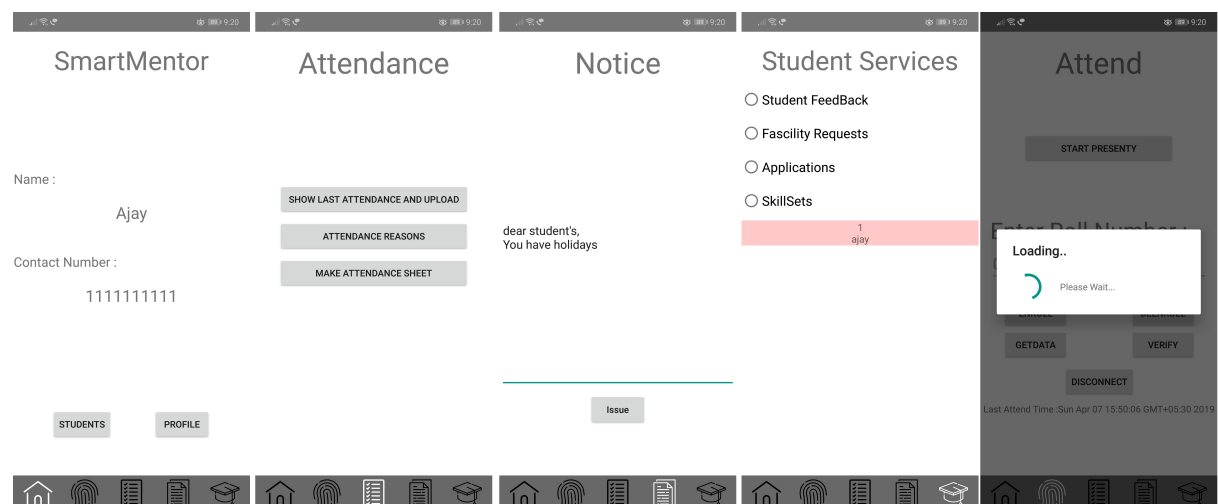
1.3.2 Mentor App

Figure 2: Mentor App Screenshots

Mentor App is to be used by the Professors to take attendance and to manage various

student services.This App has implemented Google firebase API which allows easier access to realtime database which is synchronised with student App.
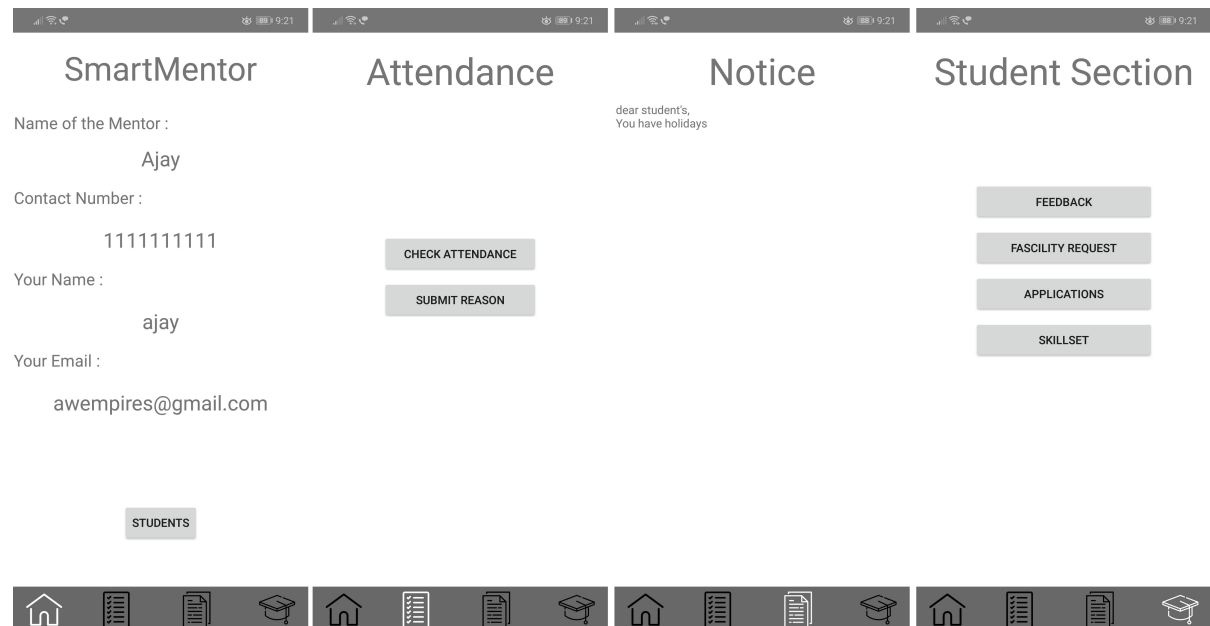
1.3.3 Student App

Figure 3: Student App Screenshots

Student App is to be used by the Students to check attendance and to manage various student services.This App has implemented Google firebase API which allows easier access to realtime database which is synchronised with Mentor App.

1.3.4 Attendance Device

Attendance Device uses a display to indicate about fingerprint authentication status and instructions while enrolling and deenrolling.Persistent ram is used to store Attendance data , power loss during attendance will not clear current data.Fingerprint Sensor module is used to take fingerprint blueprint and carry out fingerprint identification in enrolled fingerprints.All these devices are Controlled by the core Microcontroller which is having wireless connection capability to send and receive data with mobile devices.
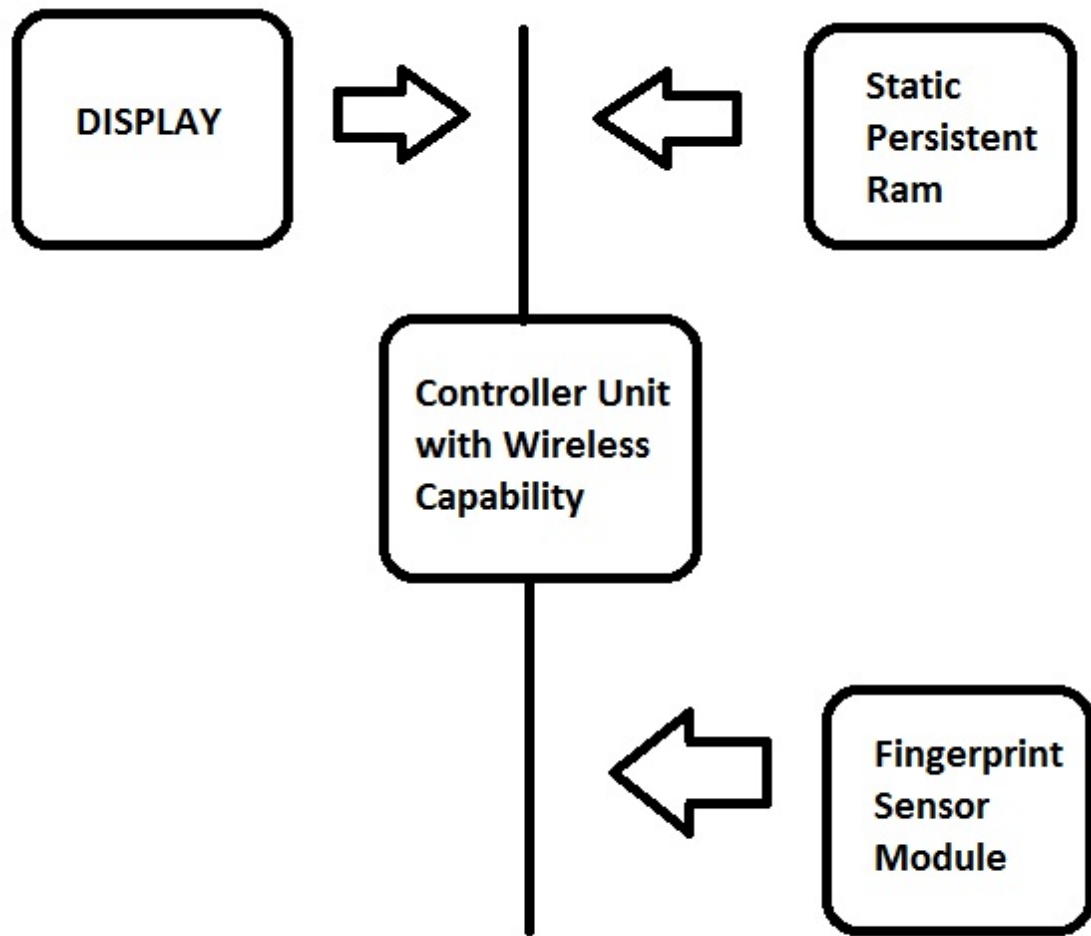
Figure 4: Attendance Device Block Diagram

2   LITERATURE REVIEW

Noticing Attendance system problems and developing smart solutions for it has been in research.There is already a proposed device which is a biometric attendance recorder that uses the fingerprint sensor in conjunction with Arduino UNO. The device stored the fingerprint impressions of all the faculties and students of an institute through the process of enrolment. During the attendance, the registering fingerprint of students was matched with the enrolled database. In case of a match, the name of the student was registered in that device and sent wirelessly to an in-lab made Android application through Bluetooth protocol service. The Android application is only accessible by the authorized personnel to monitor the student attendance and to share for academic record. [1]

A face Recognition based attendance system is also already proposed for classroom environment.[2] A smart attendance system using Bluetooth low-energy (BLE) beacon (UniSas) is proposed and implemented in Universiti Tenaga Nasional (UNITEN).[3] but these System are prone identity transfer problem such as transferring beacons,RFID cards to others etc.

3   SYSTEM DEVELOPMENT

3.1   Hardware Design

3.1.1   Circuit Design

Circuit is designed on the basis of modular aproach. ESP8266 Witty Cloud Module , DS1307 based nonvolatile Ram, SSD1306 based OLED display are interconnected using IIC connection. GT521F52 fingerprint Sensor is interfaced to Serial UART port of Witty Cloud Module.
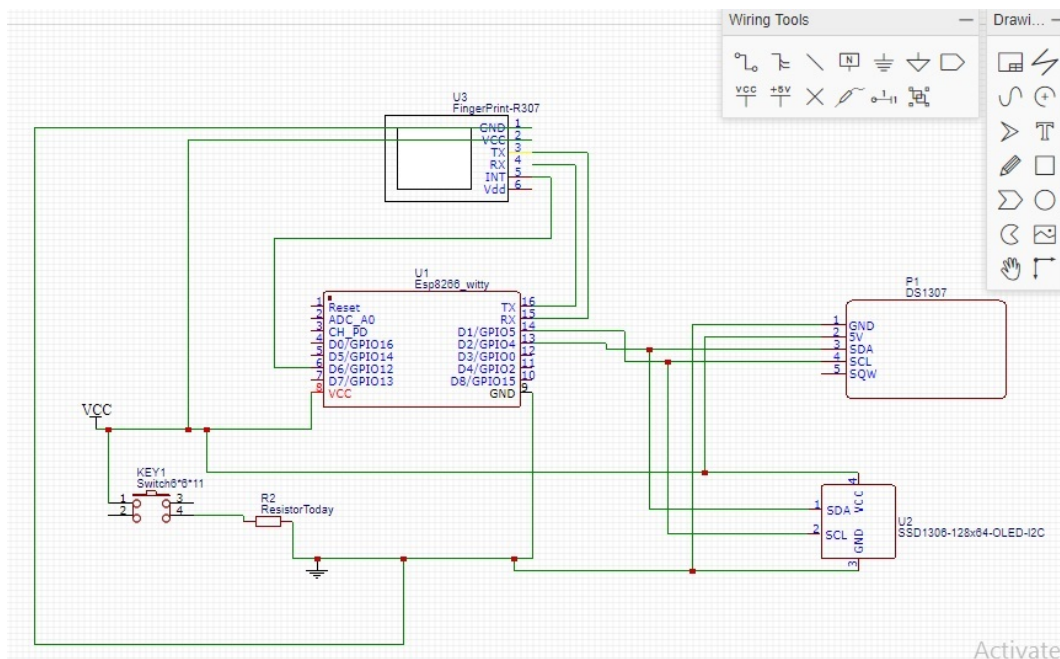

Figure 5: Circuit Diagram for Attendance Device

The main hardware used in this project is as follows:

- ESP8266 Witty Cloud Module

- DS1307 based nonvolatile Ram(IIC)

- SSD1306 based OLED display(IIC)

- GT521F52 fingerprint Sensor(Serial UART)

- PCB 15cmX10cm

- 3.7V battery

- Battery Controller

3.1.2 Cost Estimation

Table 1: Component Costs

Sr	Component	Price (in Rupees)	Quantity	Total
1	ESP8266 Based Witty Cloud Module	350	1	350
2	GT521F52 Fingerprint Sensor	2200	1	2200
3	SSD1306 OLED module	350	1	350
4	DS1307 RTC Clock module	150	1	150
5	Buck-Boost Converter for battery	200	1	200
6	1000 mAh Battery	300	1	300
				Total = 3550

3.1.3 PCB Design

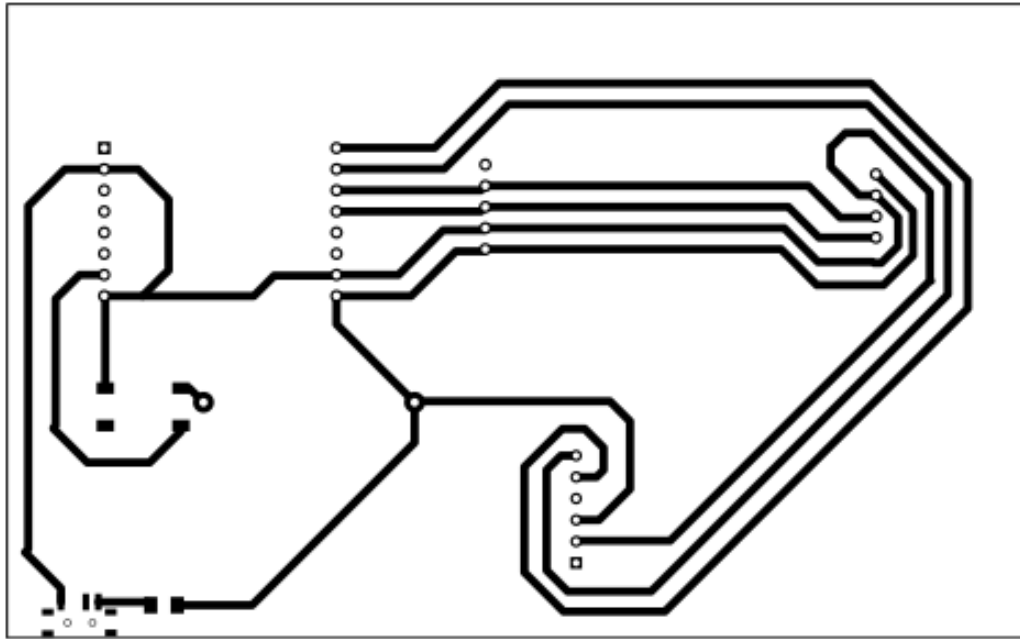PCB Design is done through EasyEDA Web Designer. This is single layer PCB layout.

Figure 6: PCB Design

3.1.4 ESP8266 Witty Cloud Module

The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by manufacturer Espressif Systems in Shanghai, China. The chip first came to the attention of western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at first there was almost no English-language documentation on the chip and the commands it accepted.[2] The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, chip, and the software on it, as well as to translate the Chinese documentation. The ESP8285 is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi. The successor to these microcontroller chips is the ESP32, released in 2016
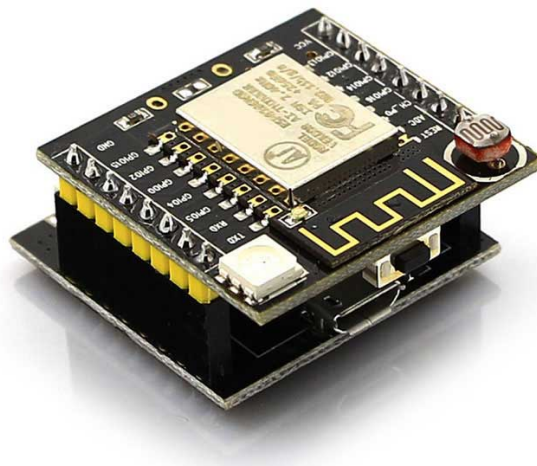
Figure 7: ESP8266 based Witty Cloud Module

- Processor: L106 32-bit RISC microprocessor core based on the Tensilica Xtensa Diamond Standard 106Micro running at 80 MHz

- Memory:

  - 32 KiB instruction RAM

  - 32 KiB instruction cache RAM

  - 80 KiB user-data RAM

  - 16 KiB ETS system-data RAM

- External QSPI flash: up to 16 MiB is supported (512 KiB to 4 MiB typically included)

- IEEE 802.11 b/g/n Wi-Fi

  - Integrated TR switch, balun, LNA, power amplifier and matching network

  - WEP or WPA/WPA2 authentication, or open networks

- 16 GPIO pins

- SPI

- IC (software implementation)

- IS interfaces with DMA (sharing pins with GPIO)

- UART on dedicated pins, plus a transmit-only UART can be enabled on GPIO2

- 10-bit ADC (successive approximation ADC)

3.1.5 RTC ds1307

Figure 8: DS1307 RTC Module/Non volatile RAM

The DS1307 serial real-time clock (RTC) is a low power, full binary-coded decimal (BCD) clock/calendar plus 56 bytes of NV SRAM. Address and data are transferred serially through an I2 C, bidirectional bus. The clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The end of the month date is automatically adjusted for months with fewer than 31 days, including corrections for leap year. The clock operates in either the 24-hour or 12- hour format with AM/PM indicator. The DS1307 has a built-in power-sense circuit that detects power failures and automatically switches to the backup supply. Timekeeping operation continues while the part operates from the backup supply. It's includes following features as well : 56-Byte, Battery-Backed, General-Purpose RAM with Unlimited Writes . Simple Serial Port Interfaces to Most Microcontrollers I2C Serial Interface. Low Power Operation Extends Battery Backup Run Time
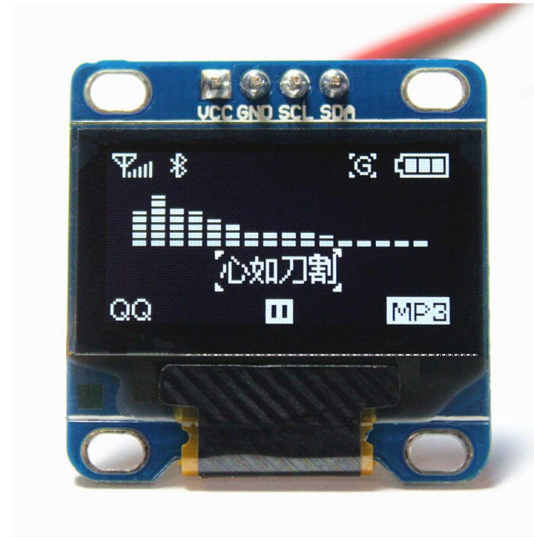
3.1.6 128x64px SSD1306 based OLED display

Figure 9: SSD1306 based 0.96" OLED Display Module

SSD1306 is a single-chip CMOS OLED/PLED driver with controller for organic / polymer light emitting diode dot-matrix graphic display system. It consists of 128 segments and 64commons. This IC is designed for Common Cathode type OLED panel. The SSD1306 embeds with contrast control, display RAM and oscillator, which reduces the number of external components and power consumption. It has 256-step brightness control. Data/Commands are sent from general MCU through the hardware selectable 6800/8000 series compatible Parallel Interface, I2C interface or Serial Peripheral Interface. It is suitable for many compact portable applications, such as mobile phone sub-display, MP3 player and calculator etc.

3.1.7 GT521F52 Fingerprint Sensor Module

The GT-521FX2 is high performance fingerprint module that is able to be waken by a finger touching the metal frame of sensor. It is one chip fingerprint module designed for integration into products with UART interface. It configure as USB mass storage device so it no need additional effort to handle driver. The active area allows stable imaging and ability to cope with mass market applications in need of both security and convenience. The reader within the MCU device is high performance, low power consumption 32-bit

Figure 10: GT521F52 Fingerprint Sensor Module

microcontrollers based around an ARM® Cortex™-M3 processor core and the fingerprint algorithm is processed on it.

Features :

- Simple UART USB communication protocol

- Complies with USB 2.0 full-speed (12Mbps) specification

- Ultra-thin Optical Sensor

- Resolution 450 DPI

- GT-521F52 3000 fingerprints storage,GT-521F32 200 fingerprints storage

- Wake up on Finger Function

- Works well with dry, moist or rough fingerprints

- Anti-Scratch with surface high hardness 5H

- 1:1 verification, 1:N identification

- Reading writing fingerprint template(s) from/to the device

- High-accuracy and high-speed fingerprint identification technology

- Downloading fingerprint image from the device

- Convenient Safe Facilitation—Just one touch and easy to enroll

3.2 Software Design

3.2.1 Attendance Device Main Program Flowchart
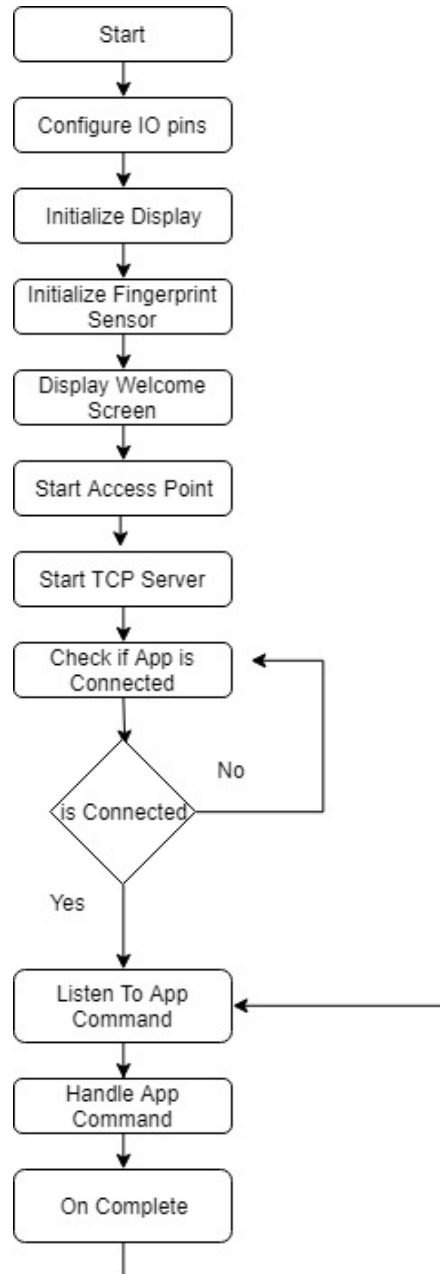

Figure 11: Attendance Device Main Program flow chart

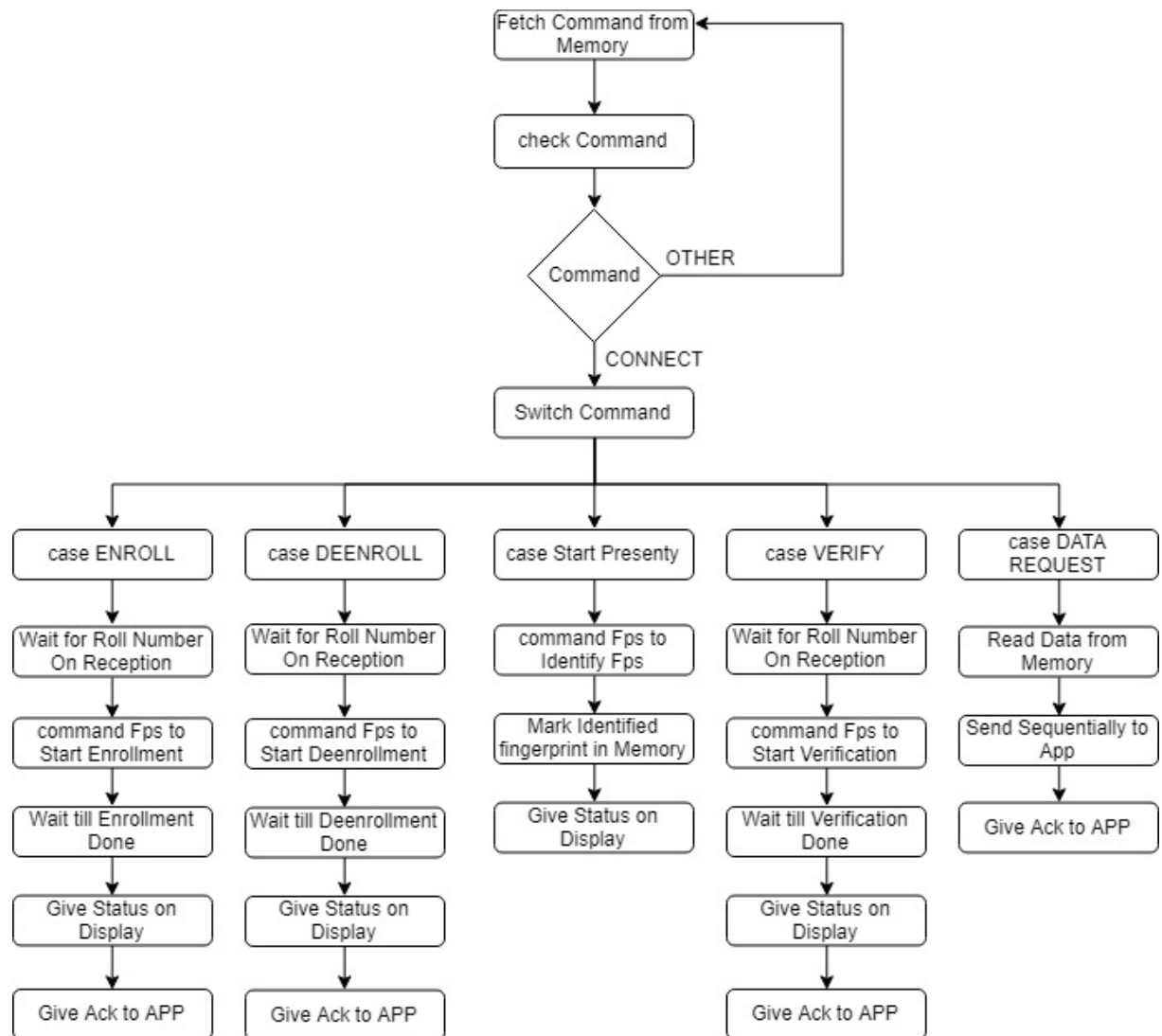### 3.2.2 Attendance Device Functions Flowcharts

Figure 12: Attendance Device Command Program flow chart

3.3   Database and Backend Description

Figure 13: FireBase Database for Mentor and Student App

Mentor and Student Apps are Backed by Google Firebase Backend Services.Firebase provides easy way to integrate the system in App and to scale it to large extint whenever needed.The Firebase Realtime Database is a cloud-hosted NoSQL database that lets Developer store and sync data between your users in realtime. Realtime Database ships with mobile and web SDKs so Developer can build apps without the need of servers. He can also execute backend code that responds to events triggered by your database using Cloud Function for Firebase.

4   CONCLUSION

4.1   Expected behaviour

System is Designed on the base of modular Approach. It is Supposed to work without any problem while done proper connections.

4.2   Resultant Behaviour

System works as expected since the device is implemented on PCB there is no problem regarding connections and Modular Approach works as it was expected. Proper Handling of Exceptions doesn't causes Apps to Crash.

4.3   Conclusion

Smart Mentoring and Student Management System can easily improve work ease of professors and opens new ways to establish link between Mentors and their fellows. Attendance data is carried from electronic gadget to smartphone of mentors and then it is uploaded to the firebase servers. The Attendance device is low-cost, robust, portable and user-friendly. The device being handy and cheap gives an edge over the products that are currently available in the market. The device saves time in class, thus increases the valuable teaching learning time of teachers and students giving them greater opportunity to teach and learn respectively. This data is accessed by students to check their attendance.This cuts off lots of paper work involved. Along with Attendance other services such as giving feedback and requesting any facilities from institute is possible through student App. Time taken for getting attendance can be utilised for teaching purpose. This system is also applicable to many other places than institutions where Mentoring is the way of managing fellows.

References

[1] Swamendu Ghosh , Shafi KP Mohammed , Neeraj Mogal , Prabhu Kalyan Nayak , Biswajeet Champaty , "Smart Attendance System", 2018 International Conference on Smart City and Emerging Technology (ICSCET), ISBN 978-1-5386-1185-2, 19 November 2018.

[2] Shubhobrata Bhattacharya , Gowtham Sandeep Nainala , Prosenjit Das , Aurobinda Routray, "Smart Attendance Monitoring System (SAMS): A Face Recognition Based Attendance System for Classroom Environment" ,2018 IEEE 18th International Conference on Advanced Learning Technologies (ICALT),ISBN 978-1-5386-6049-2 , 13 August 2018

[3] M.S Mohd Azmi , M.H Mohamed Zabil , K.C. Lim , R.F Raja Azman , N.A Noor Adnan , "UNITEN Smart Attendance System (UniSas) Using Beacons Sensor" , 2018 IEEE Conference on e-Learning, e-Management and e-Services (IC3e) , ISBN 978-1-5386-7263-1 , 04 February 2019

Appendix

Data Sheets

Operational Manual

Maintenance Manual