Smart Lab Assistant with Instruments Protection

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Abstract - *In this Project we have built the smart lab assistant cum automation system which will take the student record while entering to the lab. So that entry record will be saved automatically to the main server of lab so that there is no longer need to give paper-based attendance system to the students. Well as we are monitoring all the equipment's in our lab so that if someone stoles this equipment like Mouse or Keyboard then the system will generate the notification that this thing is not there, so the Lab assistant will get notification about this so that they can easily track all devices in the lab.*

Key Words: **Atmega328, ESP8266, My SQLite, DFMiniMP3 Module, APIs, PHP My SQL Cloud, IFTTT**

1. INTRODUCTION

In Traditional way today in all colleges there is paper based attendance System is exists. Which is Very easiest and Common way of taking the attendance of students. With this methodology of attendance system there is no Accuracy of Entrance and Exit time as well as we cannot control on Students behaviour of Enrolling the Fraud Proxies of Attendance. This is the drawback of this system. But to Overcome this problem Some institutes and Colleges also have the Biometric Attendance system installed in their colleges with this system colleges solved the problem of Fraud attendance.

But Drawback of this system is that we need to take students attendance manually by connecting this system to our PC with Ethernet Cable and using the Software of This Finger Print System. Which is Time Consuming task and not only that we need to Analyze the attendance with help of Excel sheet which also consumes our time and after that we can get the Proper Result.

So, this System is also good but needs Human Efforts for proper results and then we can get monthly database of student's attendance in Excel Sheet. But the in our We had been catered this problem with the help of Internet and other Automation Services which is integrated in our system. Our Solution is Totally based on Internet All Students record is saved in My SQL Database table on Internet as Student Enroll the Attendance His Attendance is immediately gets inserted in Database with Real time of punch-in and Punch-Out time. And he also gets the Notification about Enrollment of Attendance with the Help of SMS and App Notification with Adding the IFTTT

Webhook Service. Not Only that if Any Student will not be able to come in time our Bunk the Practical's then the Same Notification about Absence will go to his Parents. And with the Server-Side Students, parents, Staff and Admin can be able to see Attendance and Report in website. [1]

In the Second module of Project we have Implemented the Device Tracking Facility. Right now, in any colleges or in institutes there were no any facility of Labs Equipment tracking means to avoid devices from getting Stolen. Today we solve this problem with the help of lab In-charge this is Again the manual task so it can cause the problems in lack of presence of lab in-charge devices might get stolen.[2]

To Overcome this problem, we have Integrated Small WiFi Chips on all devices of lab. And this Chips we are scanning with help of our System for Every Second of time interval. Because of WiFi chips they have specified range of Signal. So, whenever anyone Stole this Devices or Move it away from lab system Generates the Voice Alert and Main Lab In-charge also gets An SMS notification about Device Stolen or Misplacement report with Device ID. So, it is Easy to Lab-In-Charge to track it Immediately and took the action on it.

2. System Description

In this project there are total two modules Attendance Recording and Device Tracking. In Attendance Recording System we firstly enrol all the Students Fingerprints using the Administrator that is lab with the help of Lab In charge. After that we fill all Students data base in My SQL Table of Systems Server. This All Information we save With respect to Finger Print IDs of that Particular Student. Using the Admin panel dashboard. Or in Device tracking system we also create same table in My SQL for every Device ID with Its location of Particular Lab. This System is works on the Client-Server Architecture. In which the main system Which is known Server which we have created on the ESP8266-12E Chips. Which continuously scan for nearby WiFi Devices and WiFi Clients. In Client side that is on the Tracking Devices we have implemented the ESP8266-01 Chip which has unique ID by which our Server can identify nearby clients. If this Client goes outside the premises of lab then server gives the alerts to our cloud server from there with the help of Way2sms APIs we can able to send free SMS to the Lab In charge. As shown in Fig.-1. Below.
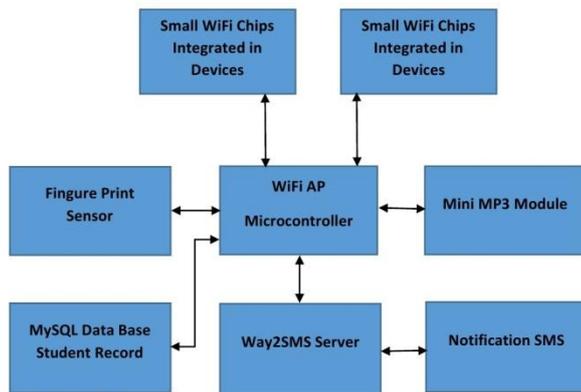
Fig -1: Block Diagram

3. Hardware & Software Design:

In design part of the system we have divided this part in two sections as hardware System Design and Software System Design as Follows.

3.1 System Hardware Design:

A. Microcontroller:

This System is Equipped with Atmel's Atmega 328 Microcontroller this is High Performance 8 Bit Microcontroller with RISC Architecture. It has 14 general purpose I/O Pins and various resources. We have chosen this microcontroller just because of it has sufficient GPIO pins to connect our various Sensors and it has 2 UARTS. In our System Major Sensors are based on Serial Communication Interface of information exchange this microcontroller best suits for this application.
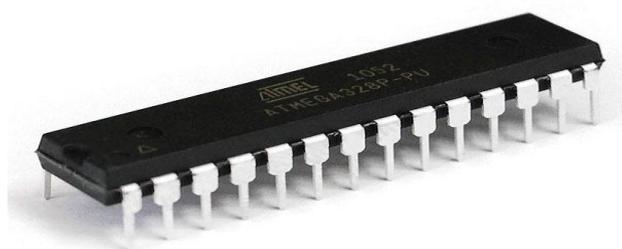
Fig -2: Atmega328P-PU

B. ESP8266-12E WiFi Module:

This is the WiFi Module with Inbuild 32-bit Microcontroller It is made by Espressif System Inc. Shanghai Based Chinese Company in 2014. It has inbuilt TCP/IP Stack, so we will use it for Communication purpose with our Server. For that we will Operate this chip in STA(Station) mode and will connect to our main Internet Enabled Hotspot or gateway Router, so it can Access internet.

Fig -3: ESP8266 12E

C. FPM10A Fingerprint Module:

For Authentication of Users we are using the Biometric finger print sensors. Adafruit Inc. Developed the FPM10A is Optical Fingerprint sensor having the ability to store 1000 Fingerprints in its inbuilt memory. It compares the Fingers with 1: N ratio and gives the TTL Compatible output to Microcontrollers to process this data it works on DC 5V.
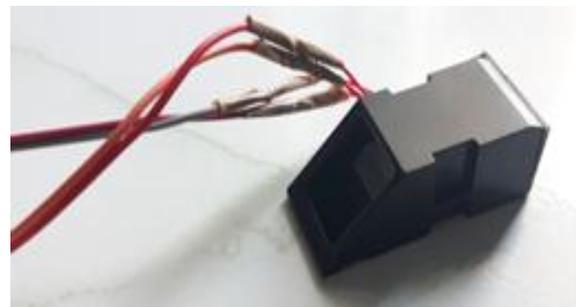
Fig -4: FPM10A Fingerprint Module

D. 16*2 LCD Display I2C:

The 16*2 Display are much better for this project as we need to show the output only in text format. So, this displays suits best with low cost. In the 16*2 Display we can put the 16 bit of Character string in one row and it has the Total 2 rows. These displays have various pins for controlling like 4 Parallel data Line, 4 Control Lines, Enable and Read/Write lines. So, it needs more than 6 GPIO pins of Our Microcontroller to reduce this much GPIO lines from our project we have attached this displays with the I2C to Serial converter module. To the I2C Configuration we can attach multiple sensors with two Line SDA and SCL only.
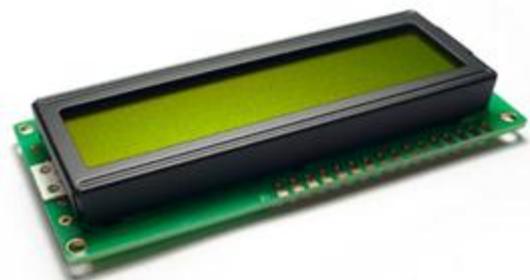
Fig -5: 16*2 LCD Display

E. DFMini MP3 Module:

The DFMini MP3 Module is a Simple voice Narrator and MP3 Module that we can interface with any Microcontroller over a Serial Protocol with Two Data line Tr/Rx. [5] In this module we save the voice or mp3 files in SD card so whenever a Trigger condition is takes place at that time microcontroller plays that specific MP3 file. So, it will look more interactive and simple to user. [3]
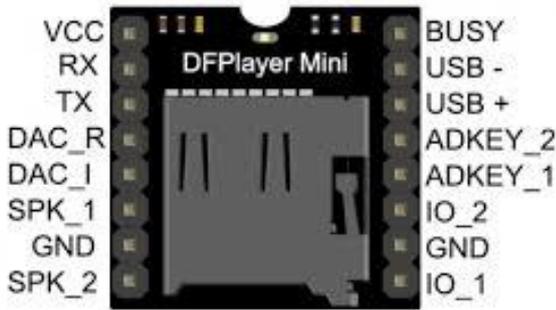
Fig -6: DFMini MP3 Module

3.2 System Software Design:

A. Main Server:

Is our system works in Dynamic nature our all database is stored virtually in real web server . [4] For that we have used free Domain Hosting site called as 000Webhosting. It provides free Domain name and webhosting, so we created one Domain name for our project and Hosted our Main server's PHP file over there. For that we have used PHPs 7.1 Version with Apache Server [5].
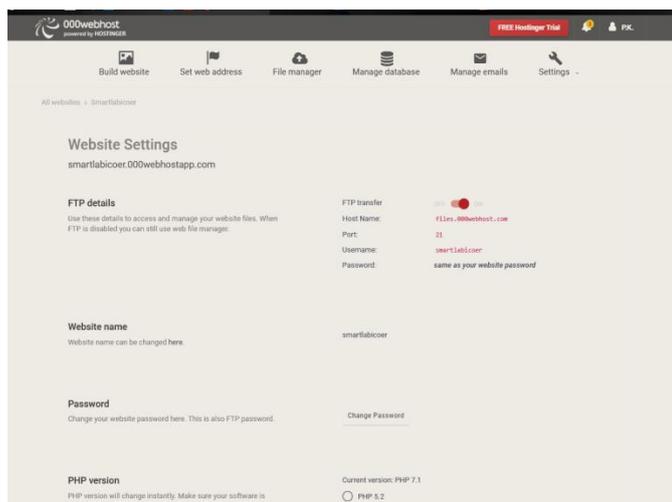
Fig -7: Server Details

In Website Setting page we can find various thing that we need for our projects like FTP Port, host name, Server Name etc. With the Help of FileZilla FTP Client, we connect with our website server then we can be able to upload all our data to that Server using FTP Client.

B. Database:

For the purpose of Data storage, we have used My SQLite Database in our System. For that we created the one database in our main Apache Website Server. In that databases we have created various tables like Student table, attendance Table for withdrawing specific data from respective table and to send it to PHP page with JSON encoding format.
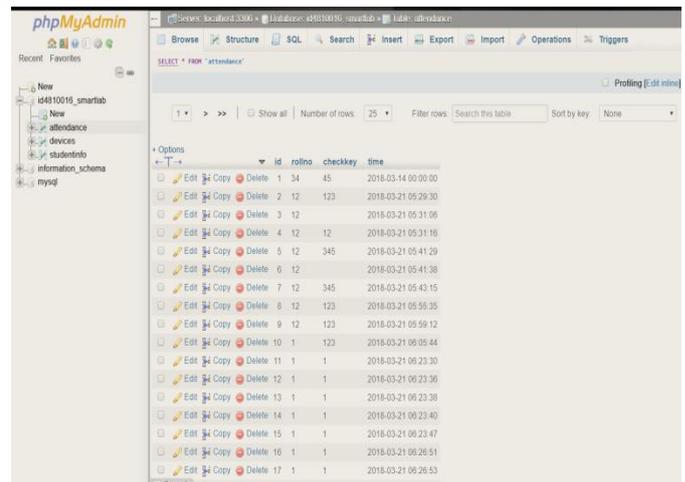
Fig -8: User Database

We can see in Fig-8 the database in PHP My Admin page by selecting proper table we can see the entries of students in database the entries are created by admin for user page like Enrolling User name Email-ID, Mobile no. etc. with the Help of PHP APIs which are created for data Insertion purpose.

B. Way2SMS Server:

To Send SMS after Device goes out of range or after Student is absent we have used the Way2sms.com service. With this service we can send SMS to respective user by fetching its mobile number data from student database table with roll no and reference no with the help of this 3rd party SMS service provider. For that we need to create an account on Way2SMS site and this login credentials we have to save on our PHP send SMS API page. Then this page will take all data from respective database and send SMS to respective user. With this free way2sms service we can send up to 100 SMS daily as per TRAI regularity authority of India. If the daily all transactions goes above 100s and then also if system wants to send the SMS, then we can purchase the various SMS Gateway provides with as per their packages and then we can send daily unlimited SMS from system.

4. Result & Discussion of Result:

The Overall Result Shows that when student enrolls his finger with his fingerprint the data of this Finger print ID s gets updated in Backend MySQL data base and we can see the Result of this in Frontend HTML Page.

Fig -9: System Prototype.

4.1. User Dashboard:

The System shows user dashboard When User login with his credential Details. He can be able to check all the data like Attendance record, In time out time etc. The system admin can add devices in this system by scanning all its mac address and AP name can store it into database. With the help of this dashboard. This dashboard is equipped with JavaScript Support for fast data loading and inbuilt data request to our database so no need to Refresh the dashboard again and again for new data.

4.1. SMS Notification:

The Lab In charge gets the SMS notification whenever any Device is goes out of range or if it gets stolen. The Mobile no of Lab in charge and Device no is fetched from the My SQL data base from the table of Devices. Massage consists of the alert about device stolen report along with device id. So, it gets easier to lab in charge to know exactly which device is misplaced from the lab. As shown in Fig-10.

Fig -10: SMS Notification

5. CONCLUSION

This way we have created the Smart Lab Assistant and Instruments Protection System. Which will reduce the work of Lab in charge and makes system of attendance is fully automated. Without the help of human efforts, we can generate all data of attendance in one click.

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