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COLLEGE BUS SECURITY AND STUDENT MONITORING SYSTEM

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ABSTRACT:

It is important for every school to have a trustworthy and secure transportation service to ensure the safety of the students. It helps the school administration to effectively manage their bus fleet and potentially reduce mishaps. This is where vehicle monitoring takes effect. The proposed system provides real time information about various parameters of the vehicle like the location, the route, the speed, the list of passengers, the adherence of drivers to schedule and much more. The system further allows the parents to be notified when their ward alights or boards the bus. In this system, we make use of RFID and GPS technologies and connect them to a remote server over WIFI using an Arduino microcontroller. An GPS module is used to find the current geographic coordinates of the vehicle's location as well as the speed it is going at. An RFID reader identifies each student as they board or alight the vehicle by reading the id from their RFID tags. The system uses the Arduino Mega to upload the information from the peripherals to a database in the web server. The information can be accessed by the parents through a mobile application and this helps them track their wards effectively. The school administration can also access the application to ensure student safety and contact a driver or a parent. The application also allows the administration to be informed of emergencies or complaints

Keywords: RFID, GPS, WiFi, Administation,Arduino

1. INTRODUCTION:

Parents are often concerned with their child's safety and are stressed from an ever-increasing number of accidents that occur on a daily basis. They cannot help but wait until evening to know about their child's well- being with all those unpleasant thoughts held-in. Thus, tracking school buses have a very vital role to play not only in regard of a child's safety but also in regard of a parent's well-being and the schools responsibility. The proposed system addresses these very problems in an efficient and cost-effective way. This system helps track live location of students, pick-up and drop times with the aid of real time monitoring. In emergency conditions, parents and school administration, along with necessary help can quickly reach out to children's aid, with the help of real time monitoring.

This system describes a school bus display that is low price and tracks varied parameters like students aboard, adherence to route and schedule, location, speed and different data necessary for school and parents. Notification system helps to confirm individual safety of wards and additionally wastage of your time whereas students await delayed buses are self-addressed during this system with the assistance of real time

observation. Moreover, instructional boards like CBSE have started advocating the need for varsity bus observation systems. The geographical coordinates of the bus are browsed by the GPS module and are then uploaded into an information within the remote server over Wi-Fi. This information is then utilised by parents, bus drivers and school administration through a database which may be accessed by them via a mobile application.

2. BLOCK DIAGRAM:

The system has been designed and implemented as a result of the integration of various hardware and software technologies that created a complete end-to-end system. The diagram illustrates how the on-board tracking unit and the tracking server unit interact with each other.

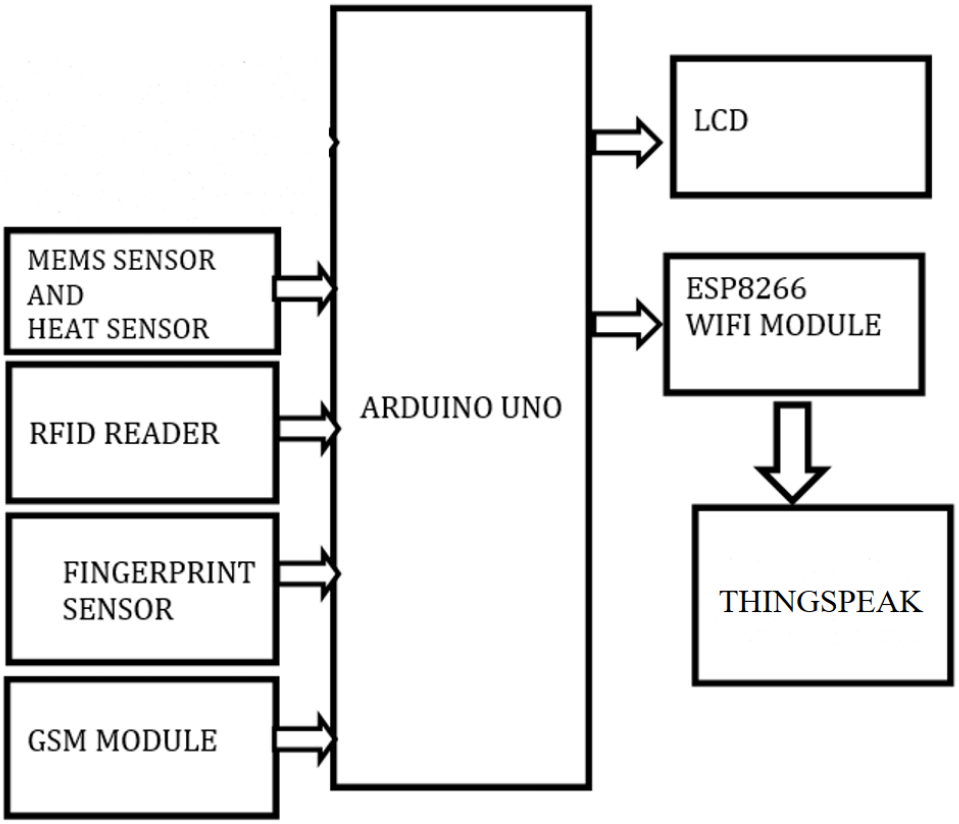


Figure 1: Block Diagram

2.1 The design parameter:

The system has been developed in response to the requirement that address the school bus issues and the safety of children. These requirements served as the design parameters for developing the system. The following are the crucial parameter to be applied in the design to fulfil the requirement of the system: (Tracking the bus location, boarding/disembarking stats of students, preventing students from disembarking at wrong stops, rejecting students from boarding a wrong bus, proximity of the bus notification, preventing students from left behind locked on the bus, SMS notification when student gets into/off the bus, creates calls from within the system, sends emergency SMS and providing attendance reports).

2.1.2The on-board tracking unit:

A microcontroller board gets data from the GPS module and the RFID reader and send this information to a server. The microcontroller board is connected to a GSM module, the module allows the microcontroller board to be connected to the internet to form a voice calls using GSM library and to send and receive data. The RFID reader scans student RFID tag, the tag is combined with the GPS coordinates received from the GPS. Then, the combined data is sent to the tracking server through a GSM communication network. The information received from the on-board tracking unit is saved on the tracking server for further processing and to build the tracking-map layer which going to be depicted on Google Maps. A speaker and a microphone enable the authorized persons and the driver to communicate to each other from within the system. A buzzer is connected to the system, the buzzer is activated when an alert is received. Also, an emergency switch is provided to the system to enable drivers to react instantly in sending an emergency Short Message Services (SMS) notification to alert authority about certain accidents or when the driver needs an emergency help.

2.1.3The on-board unit software:

The unit is programmed using Arduino development tools and loaded in the internal memory of the microcontroller. The program consists of several function modules (GPS, SMS, Phone Call, Buzzer and RFID) as shown in Fig. 4.

- When the device is turned on, it starts the setup process to connect to the GSM network and to get the GPS fix from the GPS satellite. After that, it enters the main loop to carry out a series of functional tasks.
- The GPS function retrieves the National Marine Electronics Association (NMEA) String, (NMEA is a standard data format supported by all GPS manufacturers)
- If the retrieval is successful, it converts the NMEA string to degrees and sends it to the server.
- Otherwise, it exits the function.
- The SMS function checks the state of the emergency button. If the button is activated, it sends an emergency SMS to the authorities. If not, it exits the function.
- The phone call function is only for receiving calls. If there is no incoming call it does nothing and exits. When there is an incoming call it checks the state of the button. The call is answered when the button is pushed and hangs up when it is pushed again. It exits when no button is pushed.
- The buzz function starts by checking for a received SMS notification. If an alert is received it activates the buzzer and ends, otherwise it ends.
- The RFID function scans the RFID tag, when a tag reading is captured it sends the RFID ID-tag to the server. If no reading available, it exits.

2.1.4 The tracking server :

The tracking server hosts two main software components, the database server and the web server. The server maintains a two-way interaction between the on-board unit and the user. It delivers a high-level application through independent platform web-based application. The web server and the database server reside on the same physical machine, where the machine acts as a web server and a database server simultaneously. The system provides SMS services through a third-party SMS provider.

2.1.5The tracking server and the onboard unit Interaction:

As soon as the GSM connection is established, the server receives two Hypertext Transfer Protocol (HTTP) requests from the on-board device, one to receive (the GPS coordinates and time) and another to receive (the RFID codes, bus ID and coordinates). Two Hypertext Preprocessor (PHP) scripts corresponding to each request will save the received data and store them into the database. Then it performs a sequence of actions, it analyzes the received data, and translates the received data into comprehensive high- level services notifications and reports. Finally, it stores these values using a Structured Query Language (SQL) query which matches the codes with the corresponding coordinates. Linux (Ubuntu) have been used as an operating system, Apache for the web server and MySQL is used as database management system. Many development languages have been used to realize the tracking server side, like HTML5, CSS, JavaScript and jQuery. C++ have been used as programming language to program the microcontroller and AT commands to control the GPRS shield.

2.1.6The tracking server and the SMS services :

The tracking server performs several security checks against the correctness of drop-off locations, the correctness of the bus number and the sleeping students left locked in the bus are checked. In case of any of the checks is positive, it sends an alert to the on-board device. The system sends several types of SMS notifications to the parents such as approaching drop/pick-up location, student boarding status from home/school, student disembarking status to home/school and end of the trip empty bus check. The tracking server sends requests to the SMS provider through a PHP file. The PHP file retrieves the parent's phone numbers by querying the database and then sends them through a request to the SMS provider to complete the action.

2.1.7 Testing And Awareness :

The test results showed that the functionality of the system performed adequately in terms of the defined design parameters. The system does not take into consideration scenarios where the students ID tags might be forgotten or lost. Replacing the RFID with biometric identification technology such as fingerprint or facial recognition will hinder the recognition and the validation process.

3. RESULTS:

The results of the project are clearly explained in this chapter. The setup of the project is displayed below.

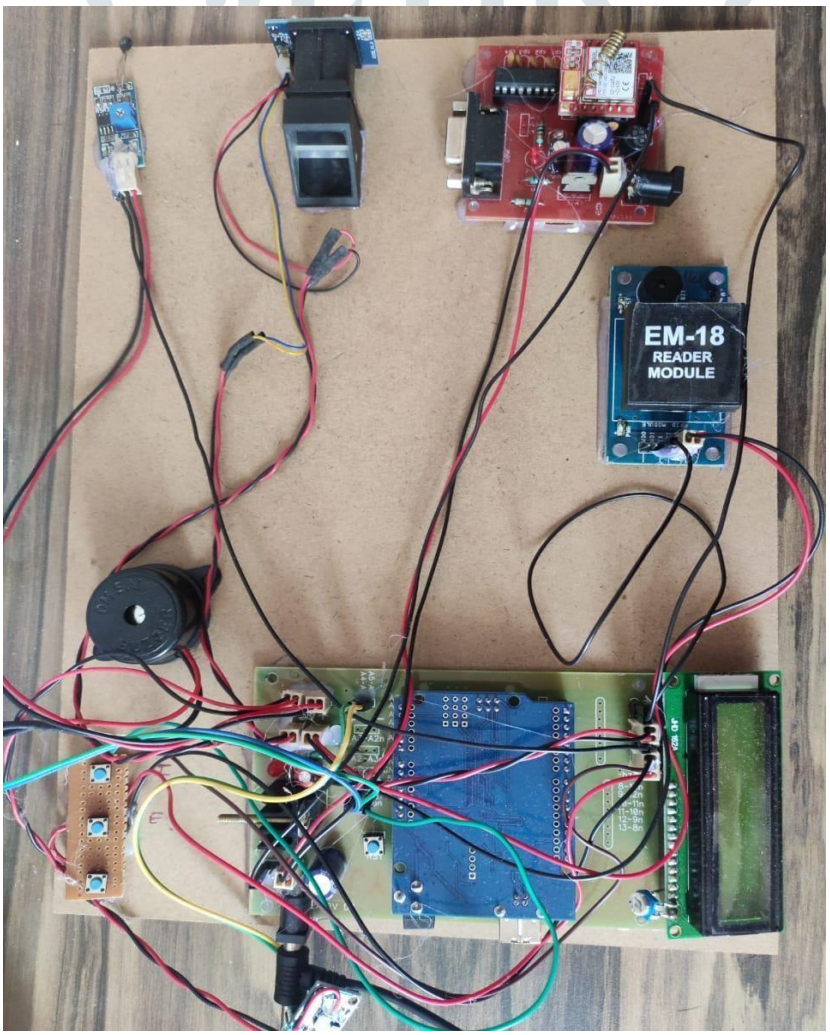


Figure 3.1: Project Setup

3.1 How to Enrol and Identify :

There are three buttons arranged in this project. The first one is to delete an enrolled data of the students. The second one is to enroll the data of the student and the third one is to identify the details of the student while getting on or off the bus.

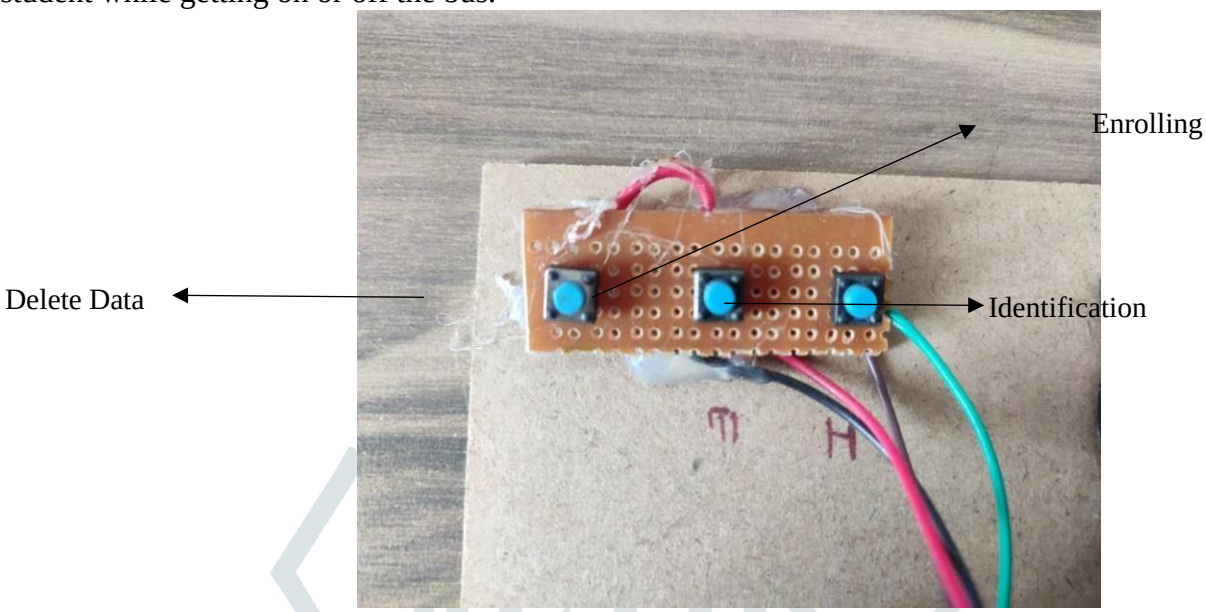


Figure 3.1.2 Three switches for corresponding application

When a student scans their card and places his\her finger a message will be sent to their parents. The module will display some commands if it was scanned successfully or not. For example, when a message is being sent, it will display the following commands.

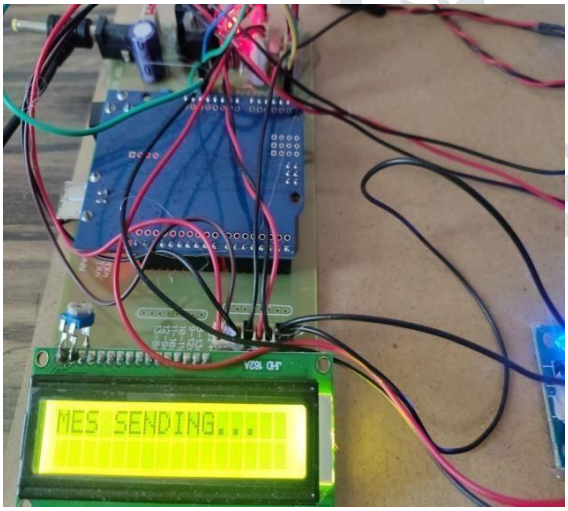


Figure 3.1.3: Message is being sent

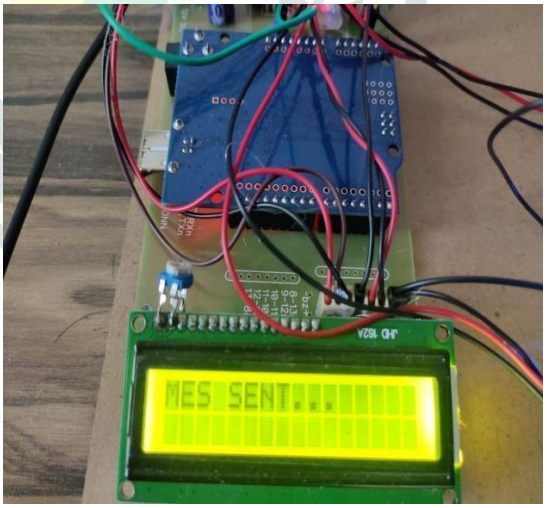


Figure 3.1.4: Message has been sent

3.2 Enrolling the student's data:

Step 1: Press the enroll button.

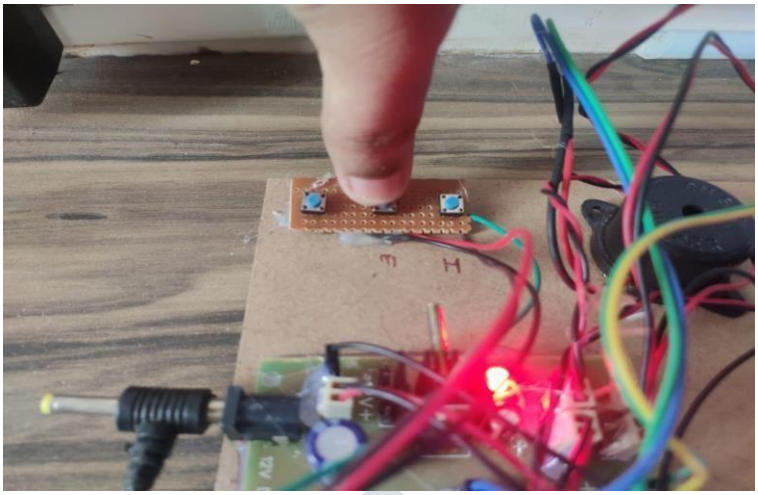


Figure 3.2.1: Press enroll button

Step 2: Place your finger on the fingerprint sensor while the module displays enrolling.

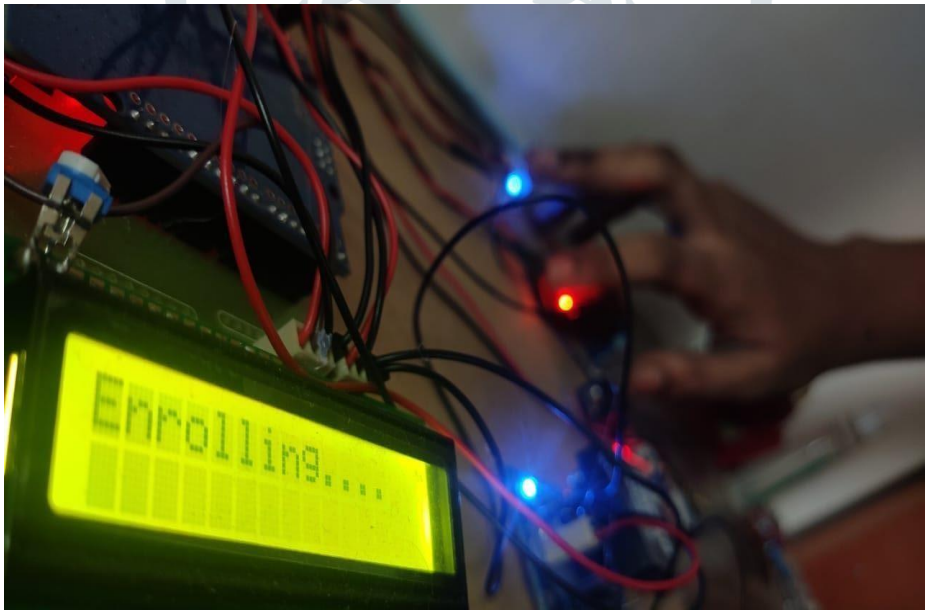


Figure 3.2.2 :Enrolling

Step 3: Remove your finger and place it again as it the module will display "remove your finger" and "same finger again".

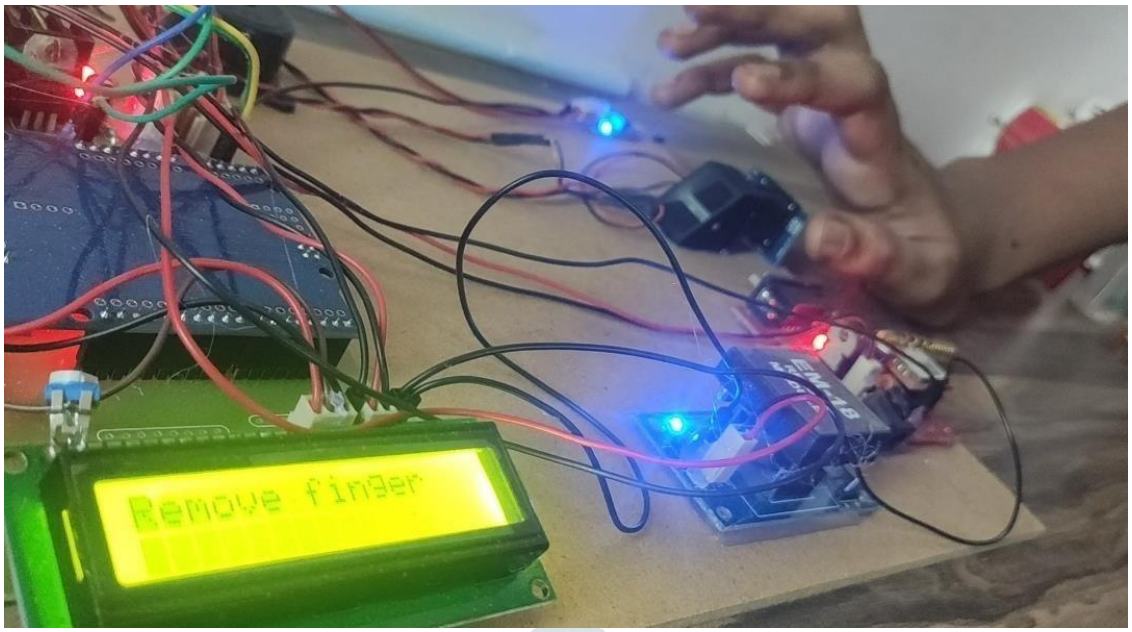


Figure 3.2.3: Remove finger

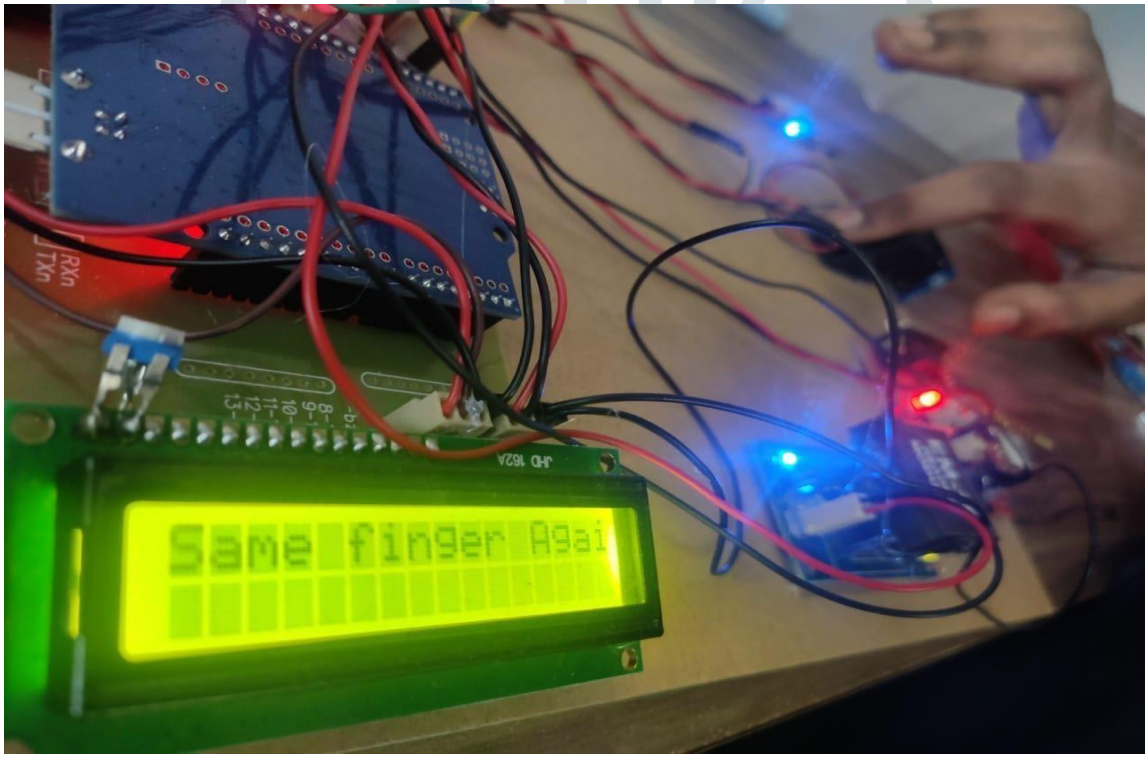


Figure 3.2.4 :Same finger again

Step 4: After the finger is scanned successfully, the module will display the stored place. The number displayed on the module corresponds to the respective RFID card.

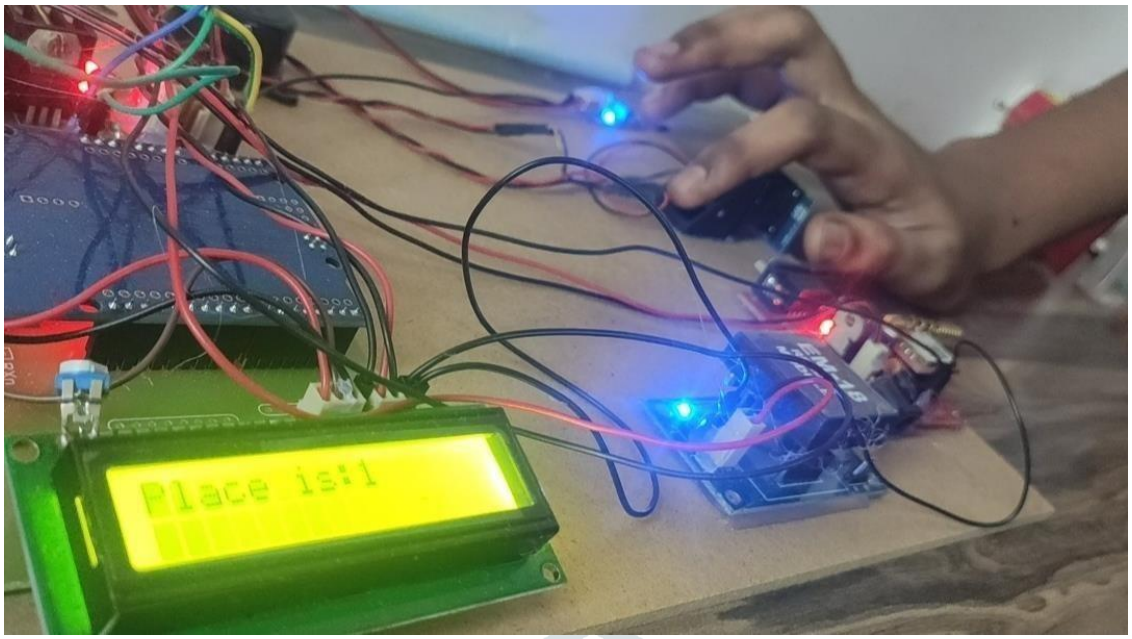


Figure 3.2.5:Stored place is 1

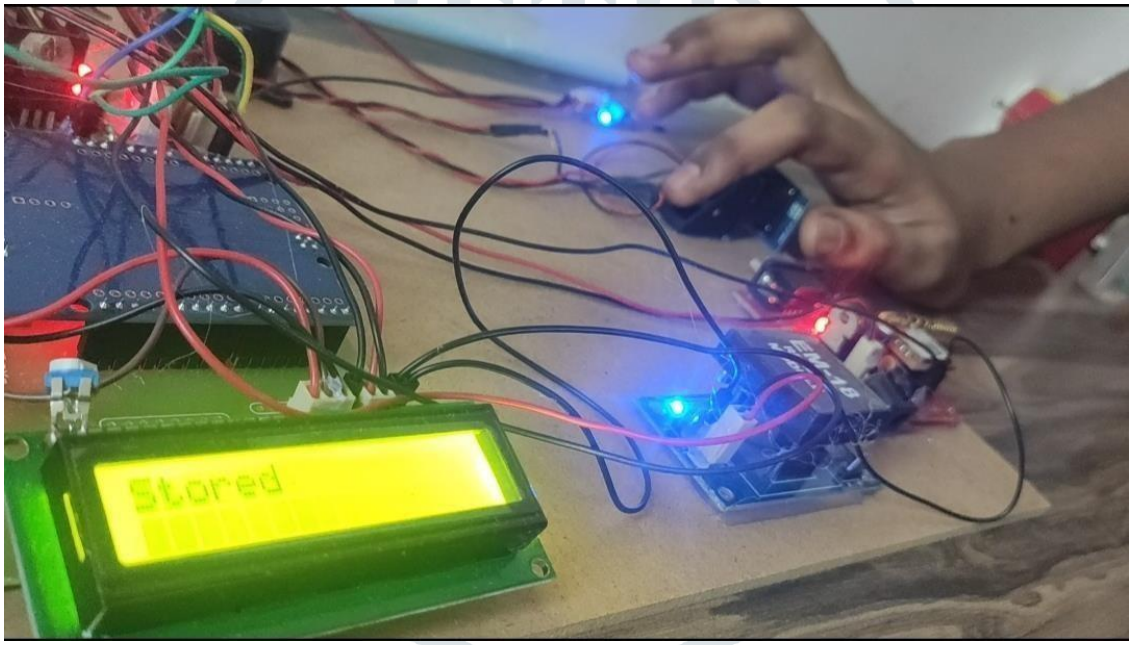


Figure 3.2.6: The data is successfully stored

3.3 How to scan card and fingerprint

Step 1: Place the corresponding card and the module will display card number.

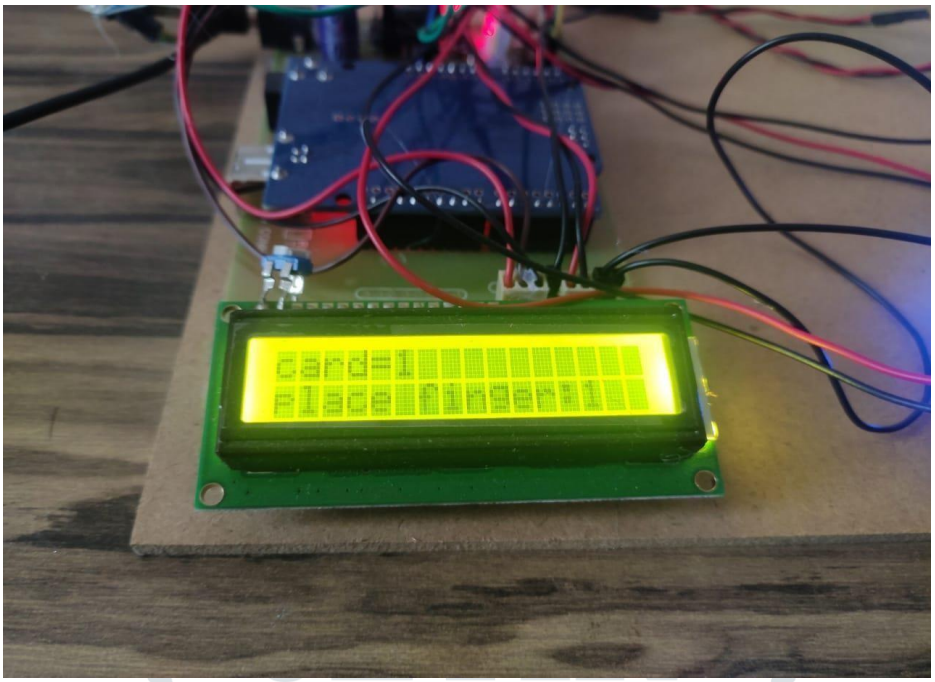


Figure 3.3.1:After scanning card the module will display the respective information.

Step 2: Now press the identify button.

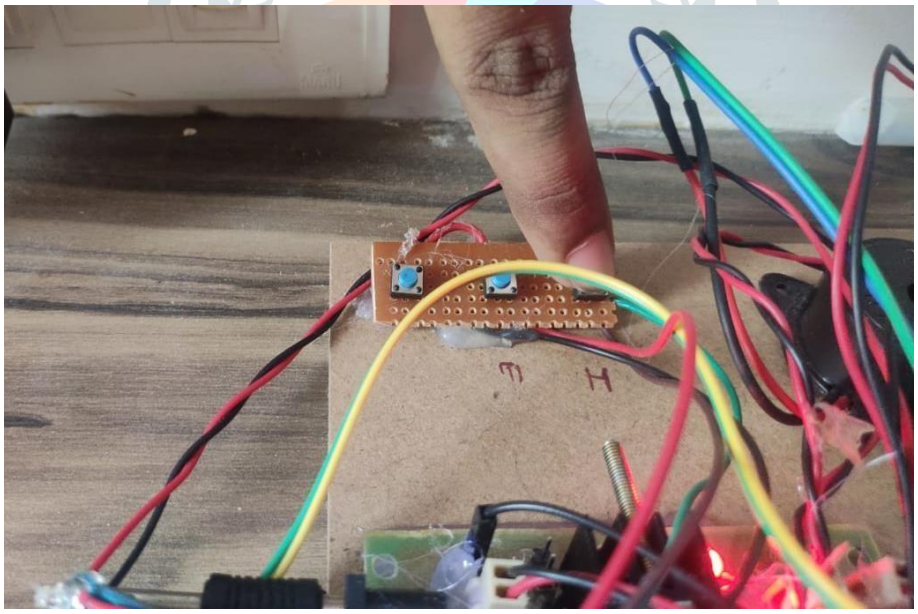


Figure 3.3.2: Press identify button

Step 3: Place your finger on the fingerprint scanner as the module displays identifying.

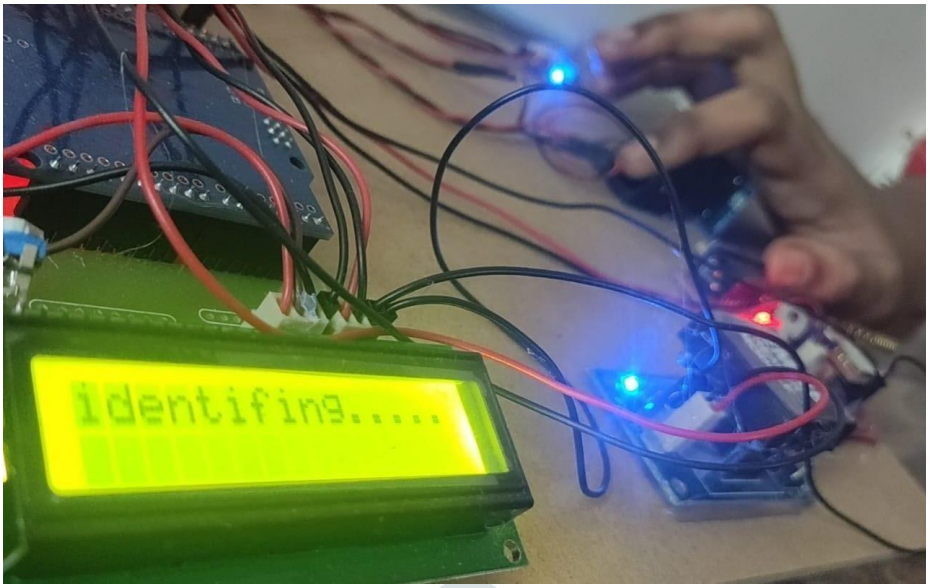


Figure 3.3.4: Identifying

Step 4: After the finger is successfully scanned, the module will display the corresponding number of the person as entry.

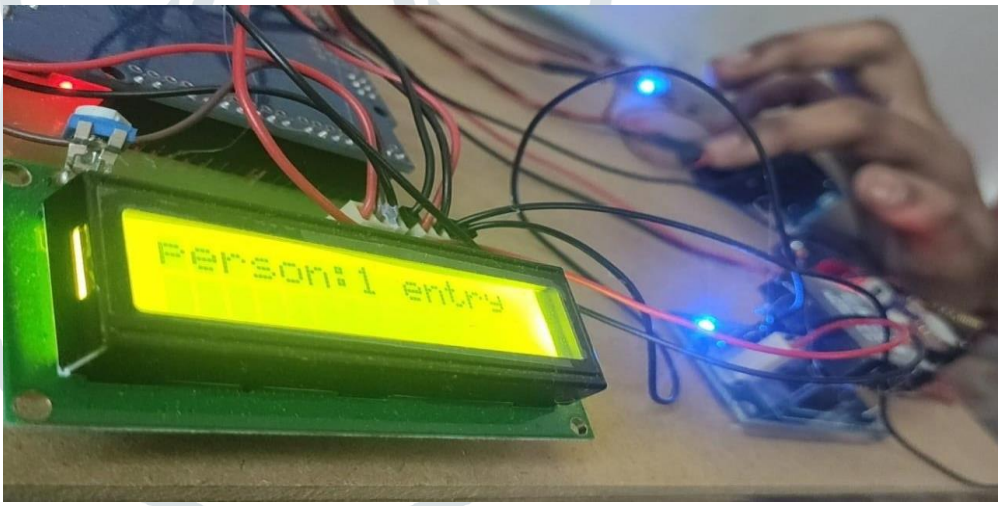
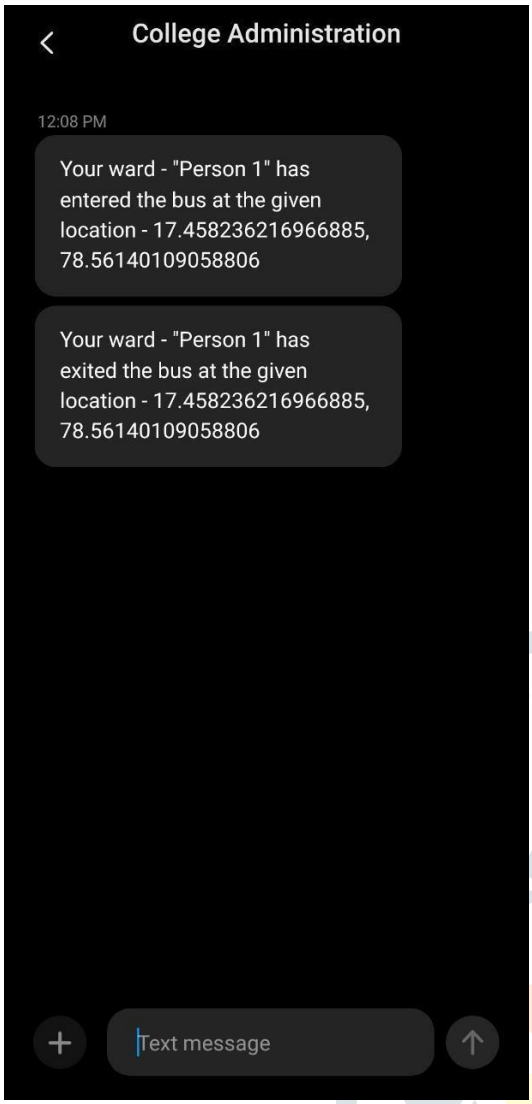


Figure 3.3,5: Person 1 Entry

Step 5: After the scanning is done, a message will be sent to their respective parent or guardian depending on the contact info given to administration. Similarly, as they get off the bus, they have to follow the same steps again and the message will be sent to their guardians regarding the location they exited at.



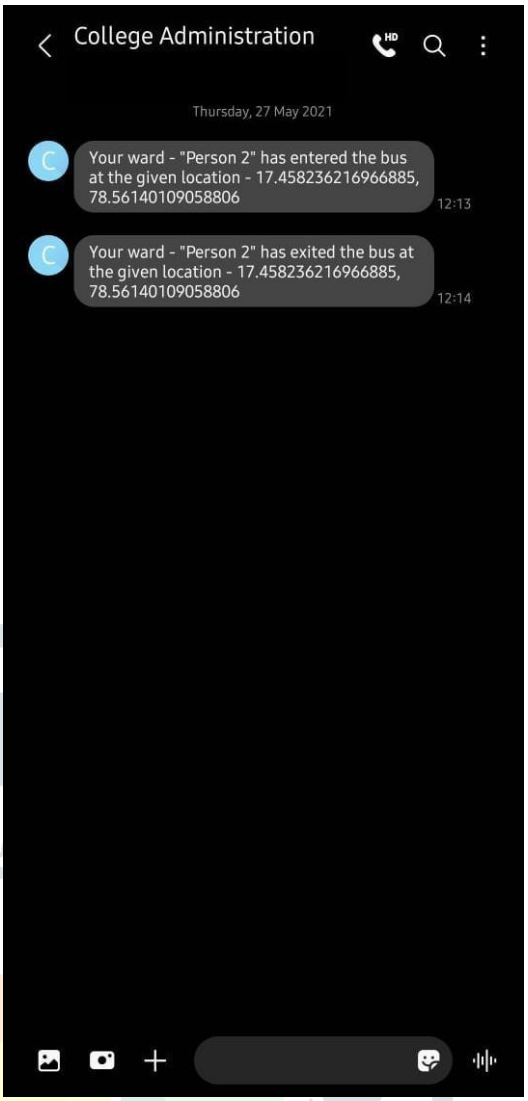


Figure 3.3.5 Text message ofPerson-1 Parents **Figure 3.3.6 Text message of Person-2 Parents**

3.4 Results of MEMS & Thermistor sensors and Proxy issues:

If the bus met with an accident and the bus turns over or even due to the high force impact, the MEMS sensor detects the motion and immediately sends a message to the college administration along with the location. For example, if you slightly tilt the MEMS sensor, the module will display vibration alert and the message will be sent to the college administration. The case is similar to the Thermistor sensor.

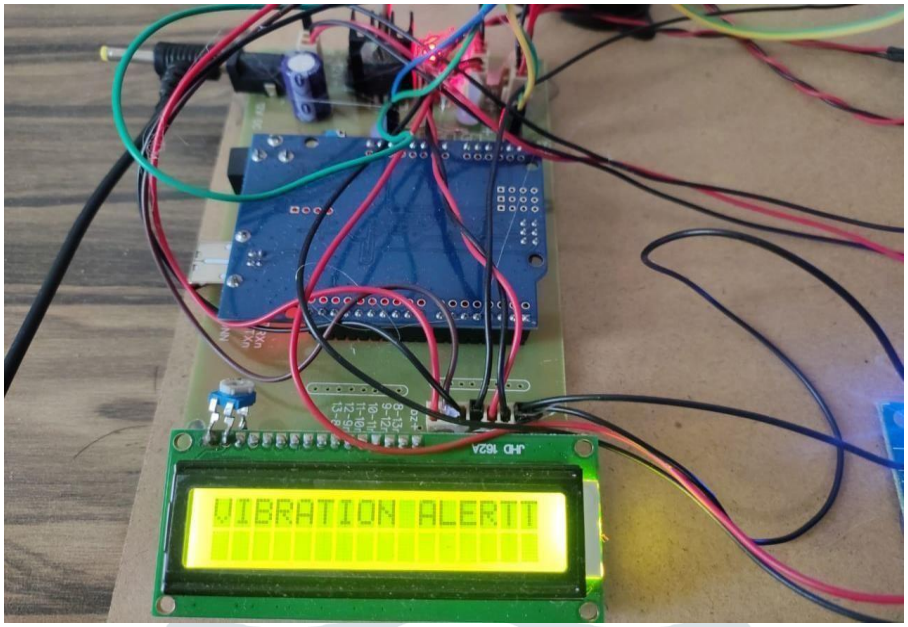


Figure 3.3.6 Vibration alert

Note: Place the MEMS sensor on top of the bus or on the dashboard with a flat horizontal surface as it is highly sensitive.

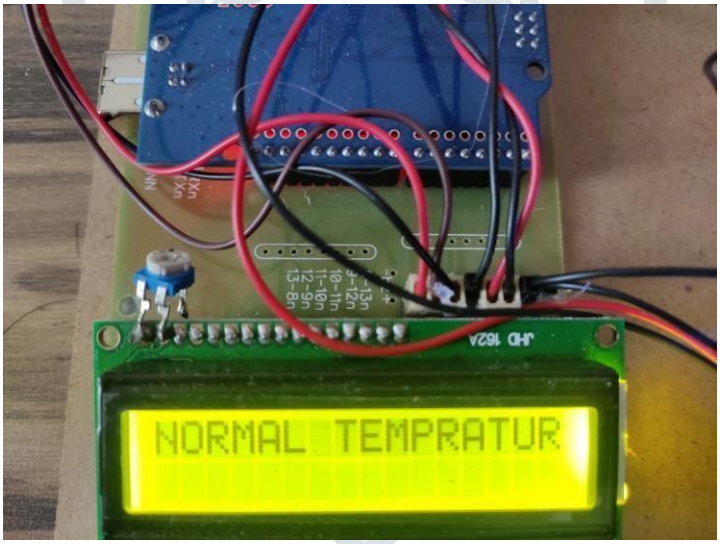


Figure 3.3.7 Normal Temperature

After the MEMS sensor is activated, the following message is sent to the college administration.

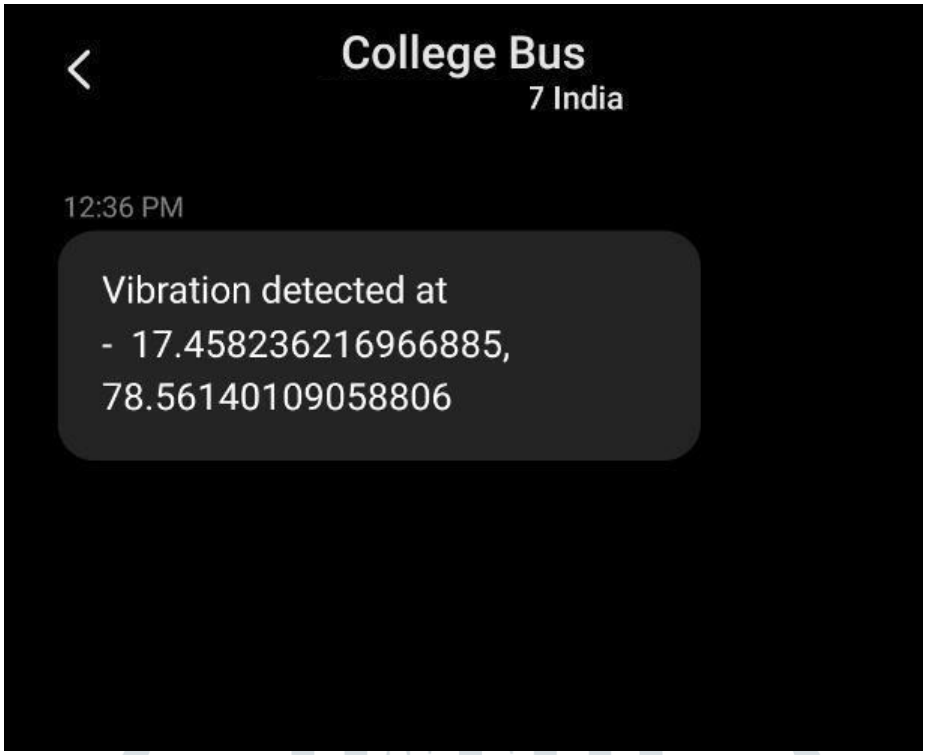


Figure 3.3.8 Message sent to the college administration.

Coming to the proxy issue, if a student tries to scan other's card and place his\her fingerprint, the module will display a message try again and if further continued and message will be sent to the college administration.

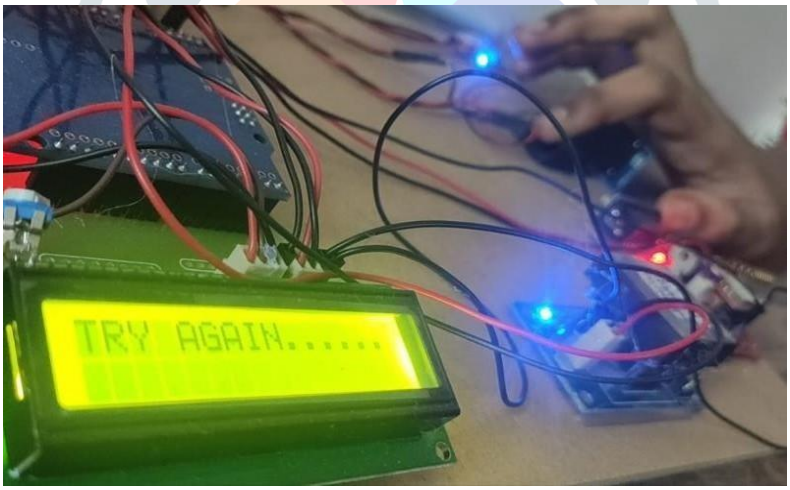


Figure 3.3.9 If not scanned properly or in case of proxy

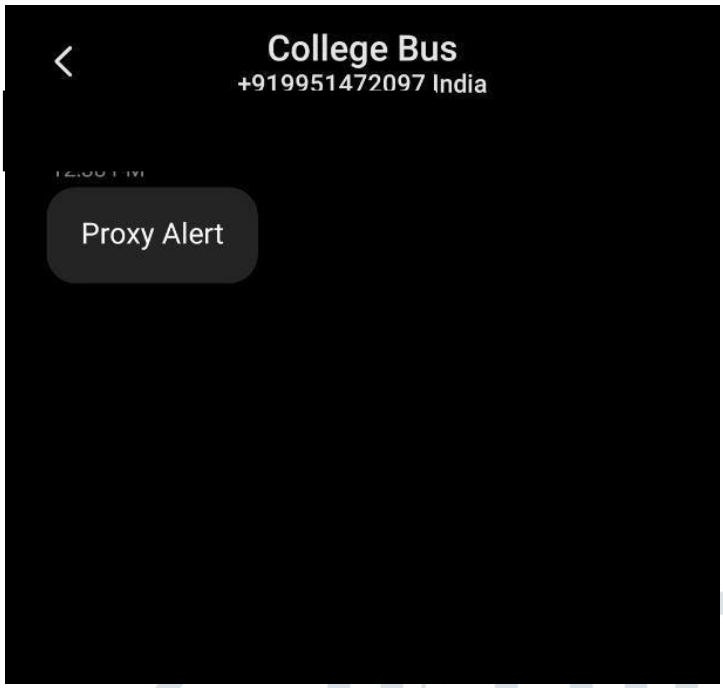


Figure 3.3.10: Message sent to college administration.

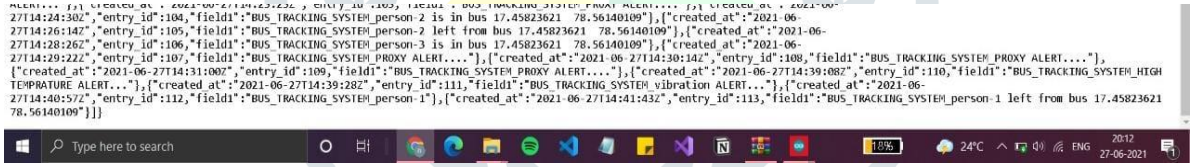


Figure 3.3.11:Thingspeak server real-time data storing

4 Conclusions:

Once the login credentials are validated, the Pickup and Drop time are being updated and displayed. Users can effortlessly track the bus and confirm its way shifting at safe speeds, preserve the authorities in charge of delays or deviations, be up thus far on the changes in agenda and speak to drivers or authorities if necessary. Admin will see the vicinity of all buses, see the list of passengers on-board, add new students, replace bus schedules and route. The school bus app could be a person friendly tool for parents to visualize their wards and school management to observe the drivers. In summary, this task has made a school bus protection device that has comprehensive protection to the commute. The device has real time following, student identification, delays, and scholar absence.

Whenever, the student he has to place his RFID tag and needs to place his finger. The both RFID and fingerprint of the student validated and sends the message to parents that their wards safely boarded the bus.After reaching to the college the parents again receive the message notification that their ward reached safely the college. Similarly, when student boards the bus while returning to the home again he boards the bus, the parents receive the message like your ward safely boarded the bus and while at departure, after getting down the bus the parents receive message like your ward safely departed with latitude and longitude coordinates.

5.Future Scope :

- In the Future, we intend to add 'live video streaming' capability to our stream so that parents, as well as the concerned authorities, can view the video showing the condition inside the vehicle in real-time.
- We also plan to improve the sensitivity and quality of our pressure pad devices. As we mostly used home-quality materials in constructing the pressure pad devices, they tend to malfunction after being for a longtime. We plan to address this issue by trying out different materials with higher longevity while keeping the material cost as low as possible.
- In addition to the above ideas, we intend to develop a web-based interface where registered parents or authorized personnel can log into the system from anywhere in the world using the web browser and internet connection and view sensor and the other data of the vehicle. \

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