

Smart Attendance using RFID and face recognition (a 2FA approach)

Preetham B R, Prajwal R, Sanjay K

Student, Student, Student

¹Department of Information Science and Engineering,

¹Atria Institute of Technology, Bengaluru, India

Abstract – Proper attendance play a vital role at both educational institutions in order to provide a better quality of education to each and every individual, hence for such critical aspect we need to have an effective and efficient way to get things done as well as have a track on it. When we speak about such and important and critical aspect of any organization for that matter, security comes as a top most priority, keeping that in mind our research uses a two factor authentication method in order to validate the individual and to ensure that our proposed work is completely secure. This research work keeps a track of each and every registered individual and can retrieve the data whenever required. With this work almost all the drawbacks of the existing system is eliminated.

Index Terms – Radio Frequency Identification (RFID), 2 Factor Authentication (2FA)

I. INTRODUCTION

Regular attendance in any educational institution is undoubtedly the most basic condition for each and every individual. Lack of efficient and proper method to monitor such an important aspect has lead to several issues in students which reflects in the results of an individual. Also with the existing manual attendance by the particular faculty will be time consuming and also it halts the continuity of the class also leading to ponderous nature of the class. On the other hand if a student is absent to any particular class, their parents will be getting a notification about the same, in order to ensure that there is constant tracking about their wards attendance. The traditional system lacks all the above mentioned factors and hence is a bigger concern in the recent times.

Our research work which uses 2FA approach eliminates the fraudulence and also propose a system that addresses each and every issue that stood strong with the traditional approaches. With this approach all sorts of fraudulence, mismanagements and carelessness is no more a issue and also there will be no hurdles to the classes and also to the quality of the class. Several other research works have used raspberry pi, but we have used ESP32 which has better performance than raspberry pi and also it have better GIOF (General Input Output Function), apart from these it also has better WIFI connectivity and also it's power consumption is very less as compared to raspberry pi. ESP32 has a very strong and powerful processor, apart from these it makes the circuit look very light instead raspberry pi makes it very bulky.

In this research work we have proposed a smart attendance system that verifies the RFID as well as face of a particular student and on successful verification, the information can also be transferred to any means as per the user requirement. Our proposed system also omits the need of space required for storing manual paperwork. This system also helps administrators save lot of time and also money and hence increasing the efficiency.

II. LITERATURE SURVEY

Sl. No	Paper Title	Authors, Publisher & Publication Year	Problem Identified	Techniques used	Outcome
1	IoT based Automatic Attendance Management System.	B. M. Sri Madhu, K. Kanagotagi and Devansh <i>International Conference on Current Trends in Computer, Electrical, Electronics and Communication (CTCEEC), 2018, pp. 83-86, doi: 10.1109/CTCEEC.2017.8455099.</i> 2018	Existing system is traditional and manual pen-paper work attendance, where lecturers have to take attendance every time of class or session in 3 ways, which are time wasting, ineffective, inefficient.	Two methods are used in this paper to effectively detect a person's RFID . First, the RFID is captured, by the RFID reader .and then the information is sent to the Raspberry pi 3.and then the related information which is present in the RFID tag is sent to the local database to store the information which is the date and the time the RFID was scanned.	The outcome of both methods is used to make the final decision and mark the date ,time and the name which was scanned .

Sl. No	Paper Title	Authors, Publisher & Publication Year	Problem Identified	Techniques used	Outcome
2	Development of Attendance Monitoring System using IoT Technologies.	Z. Mamatnabiyev <i>16th International Conference on Electronics Computer and Computation (ICECCO), 2021, pp. 1-6, doi: 10.1109/ICECCO53203.2021.9663827</i> 2021	Existing system is traditional and manual pen-paper work Attendance. Which is still the old method which is not reliable and can be manipulated.	The techniques used in this paper to effectively detect a person's RFID . First, the RFID is captured, by the RFID reader .and then the information is sent to the Raspberry pi 3.and then the related information which is present in the RFID tag is sent to the local database to store the information which is the date and the time the RFID was scanned.	The outcome of both methods is used to make the final decision and mark the date ,time and the name which was scanned .

Sl. No	Paper Title	Authors, Publisher & Publication Year	Problem Identified	Techniques used	Outcome
3	Portable Biometric Attendance System Using IOT.	S. Chennattu, A. Kelkar, A. Anthony and S. Nagdeote <i>4th International Conference on Information Systems and Computer Networks (ISCON), 2019, doi: 10.1109/ISCON47742.2019.9036275.</i> 2019	Existing system is traditional and manual pen-paper work Attendance. Which is still the old method which is not reliable and can be manipulated.	The techniques used in this paper to effectively detect a person's RFID . First, the RFID is captured, by the RFID reader .Then they have used a web-API to keep track of the attendance and the website has been written in php.	This system ensures a quick, hassle free and paperless system suitable for classrooms of the 21st century.

Sl. No	Paper Title	Authors, Publisher & Publication Year	Problem Identified	Techniques used	Outcome
4	IoT Based Secured Online Attendance Management System.	P. P. Godbole, A. Tomar, S. Bevinakoppa, P. Kundula, A. Aryal and B. B. Bhusal <i>IEEE 7th International Conference on Engineering Technologies and Applied Sciences (ICETAS),</i> 2020	Existing system is traditional and manual pen-paper work Attendance. Which is still the old method which is not reliable and can be manipulated.	This paper focuses on a Wi-Fi attendance system framework using IoT devices. Design a system that can dial in attendance using only Wi-Fi. This means that traditional assistive systems, such as biometrics and piercing, can be replaced by this system due to its lack of progress and capacity for human intervention.	Collecting large amounts of data makes data management difficult. Through this paper, a solution to address these problems was recommended by implementing a Wi-Fi assistance system with some additional features like location tracking and automated data storage in cloud server improving data security.

SI . No	Paper Title	Authors, Publisher & Publication Year	Problem Identified	Techniques used	Outcome
5	Smart Attendance Recording Device Based on Fingerprint Identification.	Maurizfa and T. Adiono <i>International Symposium on Electronics and Smart Devices (ISESD)</i> , 2021, pp. 1-4, doi: 10.1109/ISESD53023.2021.9501823. 2021	Existing system is traditional and manual pen-paper work Attendance. Which is still the old method which is not reliable and can be manipulated.	The hardware components are data acquisition devices that can record student's attendance based on fingerprint identification. In addition to identifying users, the devices also perform registration and managing user identity data storage for identification purposes.	The outcome for this proposed system is the fingerprints are scanned while Entering the premises to mark the attendance and this list will be stored in the local database.

SI . No	Paper Title	Authors, Publisher & Publication Year	Problem Identified	Techniques used	Outcome
6	Prototyping of Class-Attendance System Using Mifare 1K Smart Card and Raspberry Pi 3.	A. Bejo, R. Winata and S. S. Kusuma wardani <i>International Symposium on Electronics and Smart Devices (ISESD)</i> , 2018, pp. 1-5 2018	Existing system is traditional and manual pen-paper work Attendance. Which is still the old method which is not reliable and can be manipulated.	A student id card represented by Mifare 1K contactless smart card is tapped on the NFC card reader. It will initialize a connection and exchange information between Raspberry Pi as the host computer and the NFC card reader. In this process, required information i.e student name and student unique id number are gathered from the smart card	It is clearly mentioned that the proposed system can overcome the disadvantages of the conventional system in term of attendance signing process, automation of attendance data collection, precise attendance time recording and small possibility to data loss.

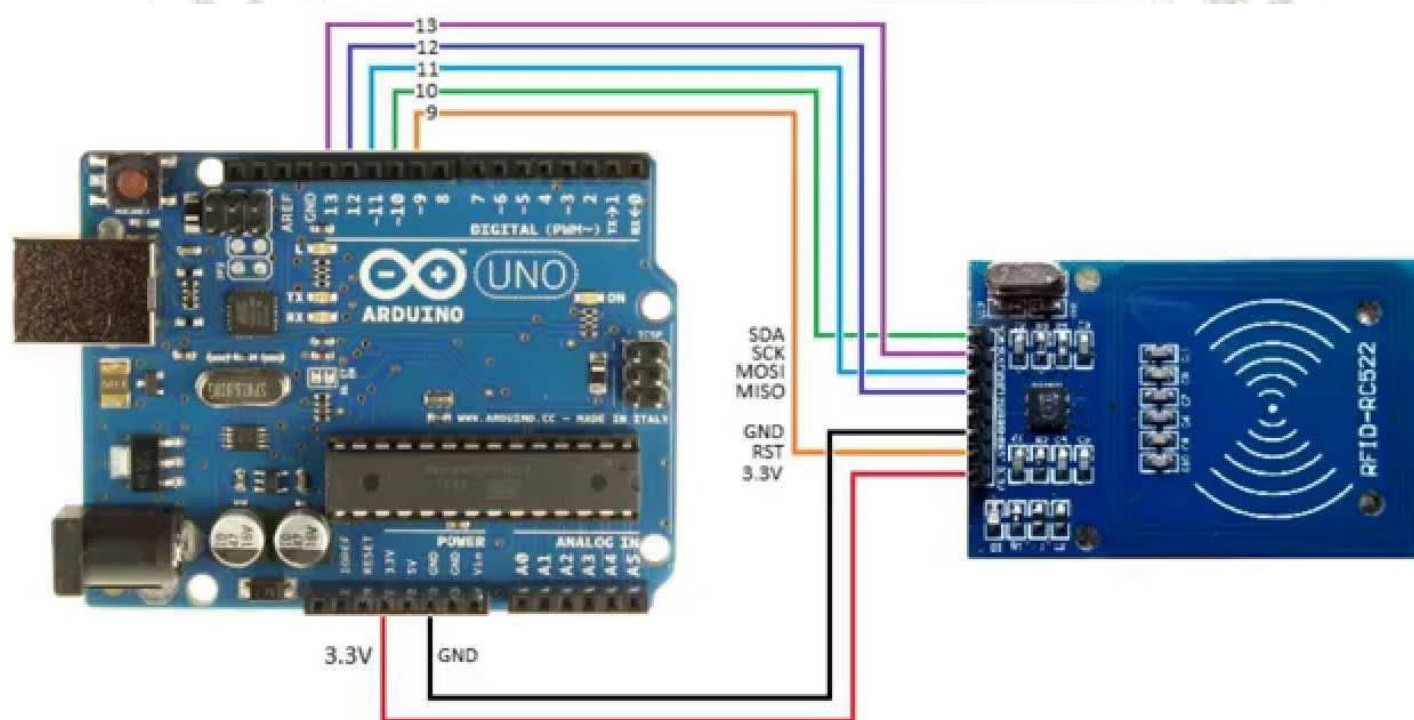
SI . No	Paper Title	Authors, Publisher & Publication Year	Problem Identified	Techniques used	Outcome
7	Implementation of IOT based Attendance Management System on Raspberry Pi.	V. Ruhitha, V. N. Prudhvi Raj and G. Geetha <i>International Conference on Intelligent Sustainable Systems (ICISS)</i> , 2019, pp. 584-587 2019	Existing system is traditional and manual pen-paper work Attendance. Which is still the old method which is not reliable and can be manipulated.	A webcam is connected to Raspberry pi3 b+ and it is placed at the focal point in the classroom. This webcam captures the images and extracts human faces. Then recognize the faces with the existing database through library files present in the OpenCV.	The camera module which is placed at the focal point in the classroom captures the 100 images of the classroom and recognize the faces in the captured images. If the probability of face is greater than 50 then it is marked as present otherwise absent. As a result, excel sheet with report of attendance is created.

PROPOSED SYSTEM

- **RFID Technology** – This technology permits devices to identify and capture the certain unique information recorded on a tag using radio waves. Compared to the barcodes, RFID provides faster identification, no line of sight, reusable to rewrite or update, higher data storage, higher read rate, multiple tag readings at a time, toughness, extreme distance reading without intrusion, cost effective. The best features of RFID are its speed, function, performance over bar code. RFID module is used as input to the NodeMCU, which consists of RFID Reader and RFID Tags with antenna.

- **MFRC522 reader** is used with features of low cost, compact size, low power consumption, portable and installable as needed. Students must need to enter in the class, so passive tags are used, which are powered through reader's electromagnetic fields to receive messages or ID data wirelessly from the reader. Because passive tags don't contain battery.

- **NodeMCU WIFI (Node Micro-Controller Unit Wireless Fidelity) Module** – It is an easily available IoT firmware in addition with the development board. It is a cheap microcontroller with inbuilt ESP8266 WIFI capability to communicate and aid full TCP/IP stacks and assist to build easier on IoT platform. This module is interfaced with RFID.



Circuit connection for rfid detection

- Along with this for face detection we make use of opencv library in python along with CMake, dlib and also face-recognition for better outputs.

- Face detection has 3 major steps:-

- 1.Face Detection:-in this step we just detect all the faces available inside the video frame.

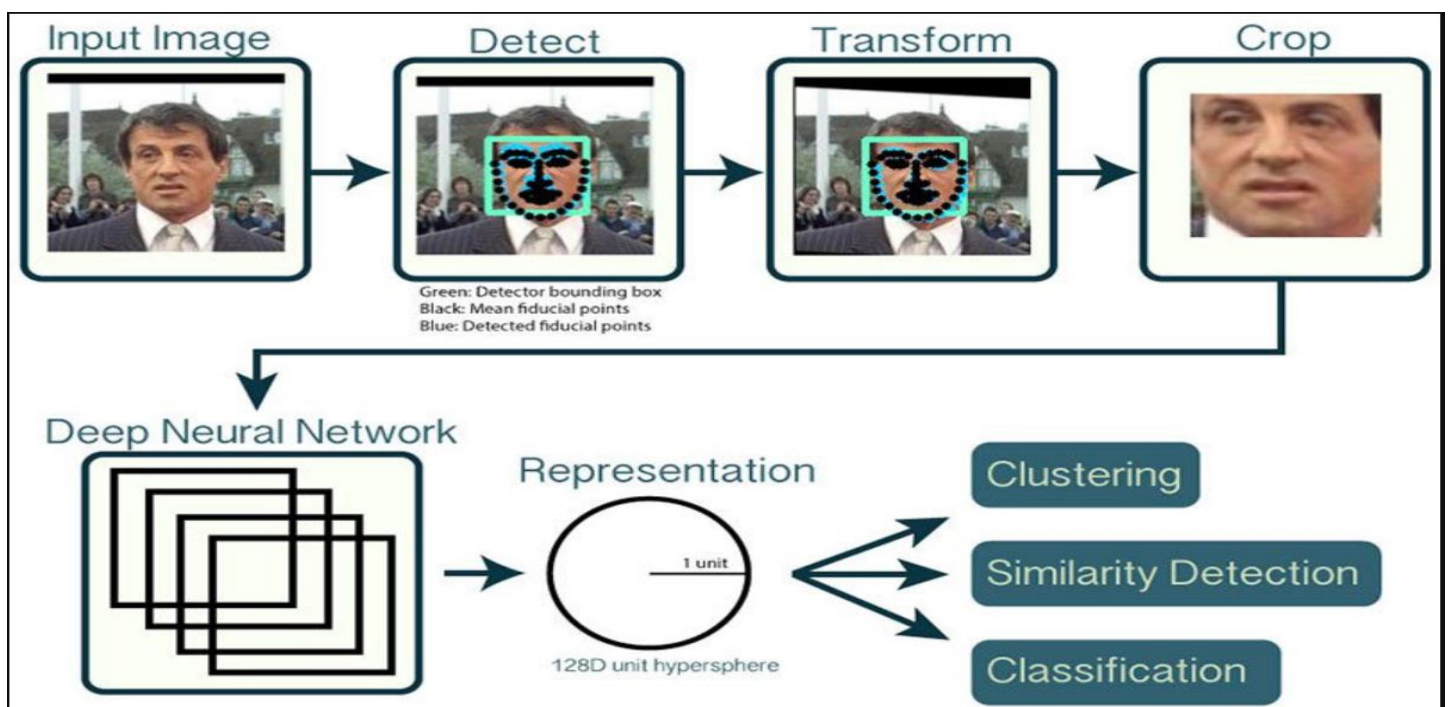
- 2.Feature extraction:-now see we have cropped out the face from the images, so now we extract specific features from them. Here, we use are face embeddings to extract these features of the face. Since a neural network takes

an image of the face of a person as input and outputs a vector that represents the important features of ones face, this vector is called *embedding* and we call this as *face embedding vector*.

3.Comparing Faces:-We also have face embeddings for each face in our data saved in a file, the next process is to *recognize* a new image that is *not present in our data*. Hence the first step is, computing the face embedding for the image using the same network we used earlier and then compare this embedding with the rest of the embeddings that we have obtained. We identify the face in case the generated embedding is very similar to any other embedding we have.

• A few of the advantages of using opencv for face detection is as shown:-

1. Open CV is free of cost and an open-source library.
2. Open CV is faster since it is written in C/C++ language.
3. Even with less system RAM, OpenCV fine.
4. It supports almost all the operating systems

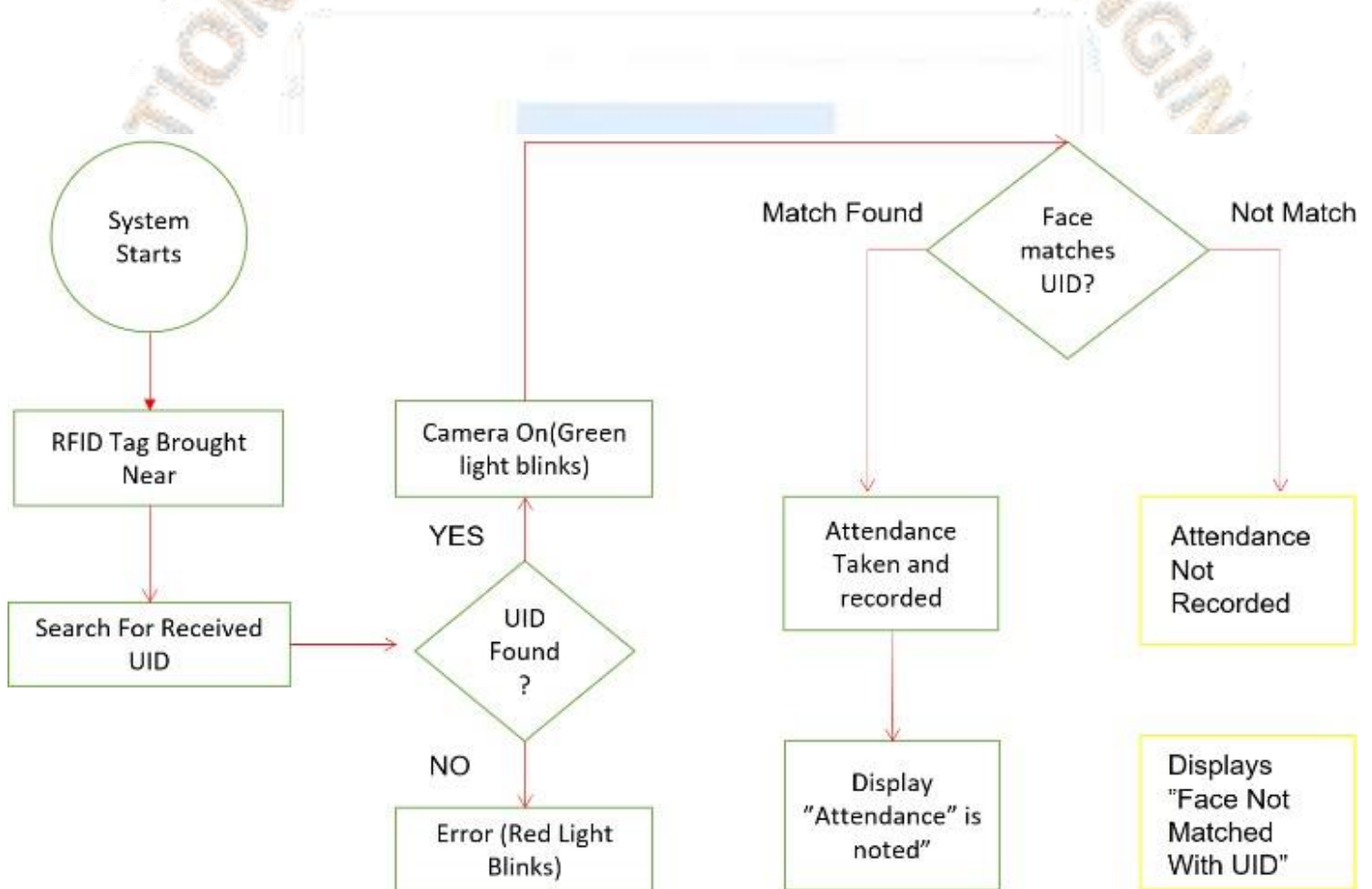


Shows how opencv works



Our datasets for face recognition

- The flowchart for the proposed system is as shown below





RFID tags

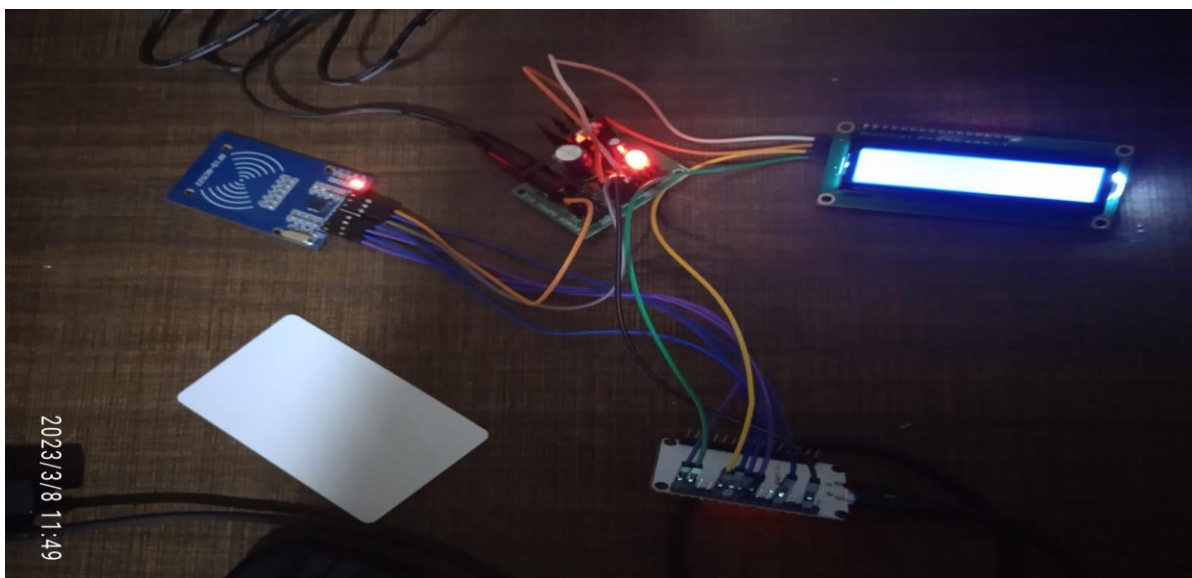


NodeMCU

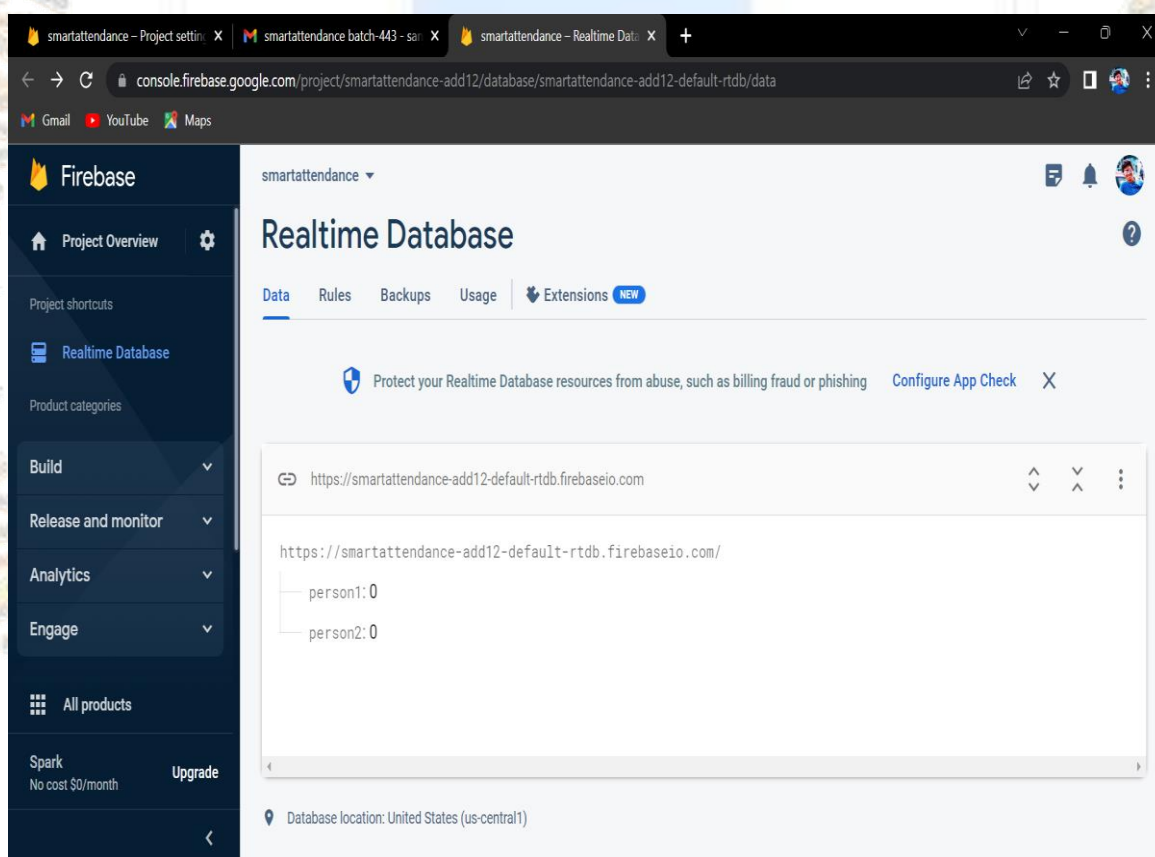


Rfid reader

Results and Discussion



Circuit connection of Rfid reading



Real time database updation

- With this kind of 2FA attendance there are several outcomes expected and they are:-
 1. **Accurate attendance tracking:** By combining RFID technology with face recognition, the system can accurately identify and track attendance of individuals in a particular location. Easily store and retrieve the data store.
 2. **Increased efficiency:** The system can streamline attendance tracking and eliminate the need for manual data entry, saving time and reducing the chances of errors.
 3. **Improved security:** By verifying the identity of individuals through both RFID and facial recognition, the system can help prevent unauthorized access and ensure that only authorized personnel are present.
 4. **Data analysis:** The system can provide valuable data on attendance patterns and trends, allowing organizations to make informed decisions on resource allocation and staffing.
 5. **Cost-effective:** The system can reduce the cost of attendance tracking by eliminating the need for manual data entry and reducing the chances of errors.

- Further instead of face recognition we can also use fingerprint recognition yet making it a 2FA approach, but a few times due to several conditions the fingerprint might malfunction hence leading to failure of the system.

- Hence, to avoid such a failure we have used the face recognition, which has way better results than fingerprint recognition.

REFERENCES

- 1.T. Sharma, S. L. Aarthy, "An Automatic Attendance Monitoring System using RFID and IOT using Cloud", Online International Conference on Blue Engineering and Technologies (IC-GET), IEEE, 2020.
- 2.Q.Miao, F. Xiao, H. Huang, L. Sun, and R. Wang, "Smart attendance system based on frequency distribution algorithm with passive RFID tags," in Tsinghua Science and Technology, vol. 25, no. 2, pp. 217-226, April 2020, doi: 10.26599/TST.2018.9010141.
- 3.M. B. Srinidhi and R. Roy, "A web enabled secured system for attendance monitoring and real time location tracking using Biometric and Radio Frequency Identification (RFID) technology", International Conference on Computer Communication and Informatics, ICCCI 2018, pp. 1-5, January 2018.
- 4.A. Kassem, M. Hamad, Z. Chalhoub and S. El Dahdaah, "An RFID Attendance and Monitoring System for University Applications", ICECS 2019, pp. 851-854, December 2019, doi:10.1109/ICECS.5724646.
- 5.T. Sharma, S. L. Aarthy, "An Automatic Attendance Monitoring System using RFID and IOT using Cloud", Online International Conference on Blue Engineering and Technologies (IC-GET), IEEE, 2020.
- 6.Q.Miao, F. Xiao, H. Huang, L. Sun, and R. Wang, "Smart attendance system based on frequency distribution algorithm with passive RFID tags," in Tsinghua Science and Technology, vol. 25, no. 2, pp. 217-226, April 2020, doi: 10.26599/TST.2018.9010141.
- 7.M. B. Srinidhi and R. Roy, "A web enabled secured system for attendance monitoring and real time location tracking using Biometric and Radio Frequency Identification (RFID) technology", International Conference on Computer Communication and Informatics, ICCCI 2018, pp. 1-5, January 2018.
- 8.A. Kassem, M. Hamad, Z. Chalhoub and S. El Dahdaah, "An RFID Attendance and Monitoring System for University Applications", ICECS 2019, pp. 851-854, December 2019, doi:10.1109/ICECS.5724646.
- 9.A. Qaiser and S.A. Khan, "Automation of Time and Attendance using RFID Systems", IEEE International Conference on Emerging Technologies, ICET 2019, pp. 60-63, Nov 2019 doi:10.1109/ICET.335928.
10. T. S. Lim, S. C. Sim, and M. M. Mansor, "RFID based attendance system", IEEE Symposium on Industrial Electronics and Applications, ISIEA 2019 -Proceedings, 2019, vol. 2, pp. 778-782, Oct 2019.