SMART ATTENDANCE SYSTEM Using Speech Recognition

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***Abstract*— Logging Attendance has been done manually for a very long time. With the growing technology and speech recognition functionalities, we can make this process more accurate without any wrong or misleading information. It is crucial to have a well-sophisticated attendance tracking system in corporate offices and educational institutions. Also, accessibility of attendance and getting a detailed status has become an essential requirement for everyone in colleges, schools, and offices. Unfortunately, we don't have an efficient attendance system and in this proposed attendance system, we used the speech recognition module proposed by Google in Python to make it intelligent and automatic. Speech Recognition is an interdisciplinary subfield of computer science and computational linguistics that develops methodologies and technologies that enable the recognition and translation of spoken language into text by computers. The proposed system stores the attendance by taking the voice input using App developed with the help of Kivy and provides a user interface to know the detailed status of the employees/students. As there is no possibility of the error except for the google speech recognition API, so a fully working and equipped is 95% accurate according to the Mary Meeker's annual Internet Trends Report which is also the human threshold.**

Keywords— Attendance, Speech to Text, Speech Recognition, Kivy, Python, Google web speech API

I. INTRODUCTION

We have seen a drastic increase in usage of technology but did not find an accurate and appropriate updated version of the traditional attendance system. We could not have an accessible and integrated user interface for it. It is not viable of not having an attendance system which can provide us the details of each department separately and also of not able to get the details of the status of the attendance of personal attendance.

Current way of getting attendance like long queuing is a big disadvantage and has to replace with a handy smart phone where they log their attendance handily. Instead of facing the issues of the attendance machine like maintenance and repair works this is a very feasible way to get the work done by just using a smart phone. This can also overcome the limitations of taking attendance manually like accuracy, accessibility and storage of the data. Also, it saves time. It can also integrate while deciding employee's salary and awarding marks to student. Therefore, this smart attendance system will let logging attendance and storing it in database. A user interface is also developed in order to display the attendance along with many other details like Student personal information, faculty information, subject details and attendance status.

The user interface is authenticated with username and password in order to get the information. This can help us getting the information in seconds without any manual work. A speech recognition system is built in the app in order to recognize the audio and log the attendance for the student with that particular roll number. Speech recognition is a technology that can transform audio to text. This has a very less chance of being incorrect. Obviously, this type of setup with a speech recognition system can ripe us many benefits and would help the administration to analyze the attendance in an efficient way.

Early systems featured only a single speaker and a small vocabulary of roughly a dozen words. Modern voice recognition systems have large vocabularies in many languages and can distinguish speech from several speakers.

Speech is, of course, the first component of speech recognition. With a microphone, actual sound is turned to an electrical signal, which is then converted to digital data with an analog-to-digital converter. After the audio has been digitized, numerous models can be employed to convert it to text.

II. RELATED WORK

Much Research have been done for developing the smart attendance system such as [11] [15].

In [1], a smartphone is used to verify the employee attendance; it provides two ways for verification either by fingerprint or by voice recognition. The accuracy was observed to be false positive of fingerprint is 95% and the accuracy percentage of 5.88 false positive for voice recognition is obtained. This proposed system is not accessible to users after recording the attendance.

[2] aim is to develop a voice recognition system and it is mainly focused on properties of speaker recognition and Euclidean distance, by calculating the Euclidean distance student attendance is stored in a database. Analysis were done in three different ways, 100% correctness is reported for the test data in the former way. The other two analyses used different test data recording. Second test data reported 76.92% correct. Third test data reported 46.15% correct.

Developing a secure and safe web-based attendance system is the main aim of [3]. With the help of RFID Technology attendance system is developed. This system can store attendance records of both faculty members of an organization and students and it is very time-taking process.

In [4], attendance system is based on voice recognition. First voice is given as input after capturing voice, voice pattern is detected and voice is converted to binary data with some encryption and the data is granted only if the data matches with the data stored in a database. It is very time-consuming process to ensure the authenticity.

In [5], an app was developed for attendance system, the attendance system is completely based on QR code generator. QR code consists of details such as student roll-number, student name, class, subject. It requires software for installation of QR code reader in order to scan the QR code image. It is time-consuming process to take attendance for each student

In [6], a website was developed for attendance system, and it is mainly focused on the accuracy and effectiveness. To record a student's attendance, [6] is created and deployed utilizing Doughman's algorithm. This solution uses biometrics and wireless technology to overcome the problem of bogus attendance and the difficulty of setting up the necessary network. It is costly and it is hard to take attendance due to presence of reflections.

In [7], For feature extraction, the system employs Power Spectral Density and the transition parameter of voice in order to take the attendance and it uses Euclidean distance and Mahala Nobis distance to verify the user voice.

In [8] [9], fingerprint based smart attendance systems are developed which are not very accurate in case of dust on fingers and old employees. [10] [12] also uses the similar criteria of fingerprint-based systems. [14] uses 3 fingerprint matching algorithms which is more accurate than others.

In [13], QR Code based system is developed where each student needs to scan the QR code which is generated by the teacher by their devices.

Here are some drawbacks in existing system:

1. Some of the existing systems are not providing GUI
2. Logging the attendance is time consuming and requires manual work
3. There are lots of chances for error occurrence
4. In most existing system users are not authorized.
5. As there is no GPS locator, there may be a chance of fake attendance or proxies

III. PROPOSED WORK

This Smart Attendance System is the combination of a Mobile Application and a Web Application. Speech Recognizer is used to recognize the voice inputs, capture the input records, and then we log them into a database. The exact architecture is shown in fig.2.

A. Speech recognizer

Fig 1 is the is a Speech Recognizer. MFCC is Mel-frequency cepstral coefficients that extracts the important features from the audio input based on amplitude, pitch etc. It converts audio, that is analog signal to digital. Mel spectrum is group of all the Mel-frequency cepstral coefficients. Mel spectrum is used for making the proposed speech recognition more efficient. Google web speech API uses MFCC. In the application developed we used Google Speech Recognizing API to recognize the voice inputs from user. The voice taken from the user is run through a python code where the imported python modules like Speech recognizer are used to analyze the inputs taken, convert them into digital form in which the machine can understand, apply the appropriate algorithm, and change the voice to text file. This text data in used to store the appropriate attendance data into the database.

Fig 1: Speech Recognizer

B. Mobile app

A Mobile application is built using Kivy in order take the voice input. The user should record their Voice using a microphone that is equipped in the Mobile App.

The speech recognizer [17] converts the audio input into text. Which is in turn stored in the database. When the student must give the attendance, the speech recognizer will recognize their voice and log attendance. The detailed architecture is shown in fig 4.

C. Database

In this system, the voice inputs of the students are stored into a database to ensure the data security and longevity. It also makes sure that we can access the data more comfortably making the website dynamic. The detailed architecture is shown in fig 5. Details of all the students and the login credentials and attendance are to be stored in a database. Each time when attendance is logged, the database will be updated accordingly.

D. User Interface

Providing a best possible graphic user interface which cannot just give us the attendance statistics but also let us know about the status if the student holds the minimum attendance

threshold. A website is developed using php and xml files where admin, teachers and students can log on. The User Interface is designed for three types of users: Admin, Faculty, Student. Admin and Faculty can get the attendance by the following two means: The details of the students in each class can be accessible by the teacher/Admin.
Search by date: It will let us know the details of all the students who are present on that date and class.
Search by student details: It works as we provide the date as an input. It will tell us if the student is present on that date.
Students can get the attendance by the following two means:
Search by date: It will let us know the details of all the students who are present on that date and Subject.
View attendance: It displays the attendance percentage of a student.
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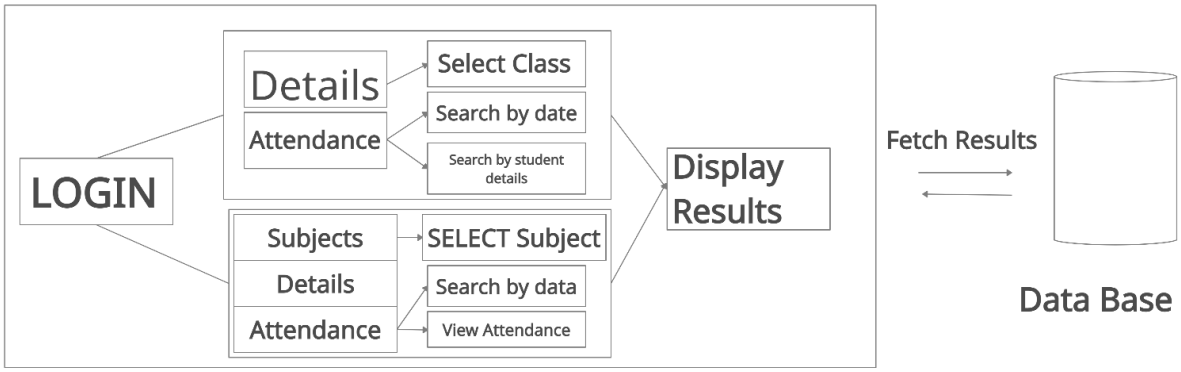

Fig 2: System Architecture

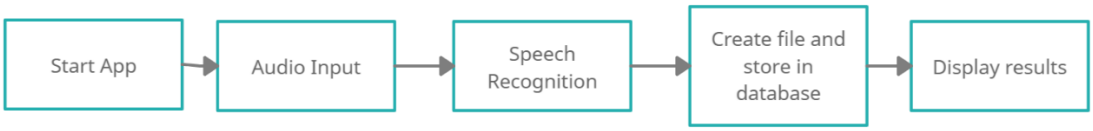

Fig 3: System Model

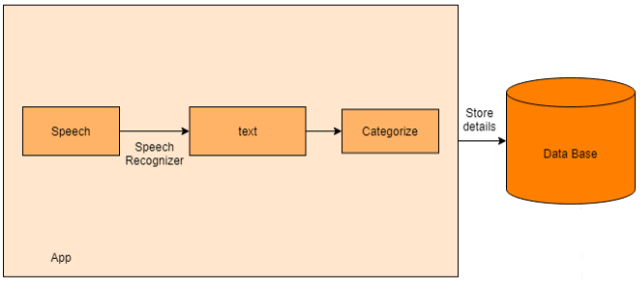

Fig 4: Mobile App

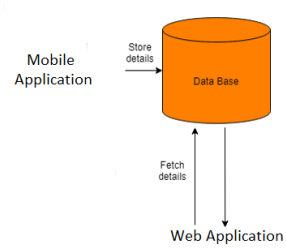

Fig 5: Database

Admin has access to the student details of every class for admin whereas the faculty has access to the student details of only the allotted classes (only the classes they teach). Students can get the details of the dates when they were present. Subjects page for students gives the details about the subjects they opted. Every user is authenticated when they log into the system. The user can reset their password whenever he/she forgets the password. The detailed architecture is shown in fig 2

E. Evaluation Method

We can find the false positives and accuracy more precisely after displaying the results. But as Google web speech API is said to work as precisely as a human being, we don't get errors until there is a lot of noise around. We have 10,000 voice samples out of which 340 samples went wrong only because the timing the input is started to be taken and the user starts talking and also the fact that the precision increases with decrease in audio width. Evaluation model is shown in fig.3

IV. RESULTS AND DISCUSSIONS

The proposed system overcame the following drawbacks in the existing system:

1. In this system, we are storing the voice inputs of the students in a database.
2. The user has to record their Voice which is stored in the database when the student has to give the attendance the speech recognizer will recognize their voice and log attendance
3. Drawbacks of the existing systems which we can overcome are:
    - Providing the GUI which is accessible for both students and teachers.
    - Logging the attendance using app which is very handy

- Less Time consuming
- Reduced error occurrence
- Users are authorized before getting the access

A. *DETAILS PAGE*

Fig 6 is the details page of Teacher which he can use to record attendance. On selecting class, he/she can record attendance for that class and app will start working

B. *SPEECH RECOGNITION APP*

On setting the Class as shown in Fig 7, it starts recording the attendance and stores the logs. After storing the logs, it displays Attendance logged toast. When attendance is

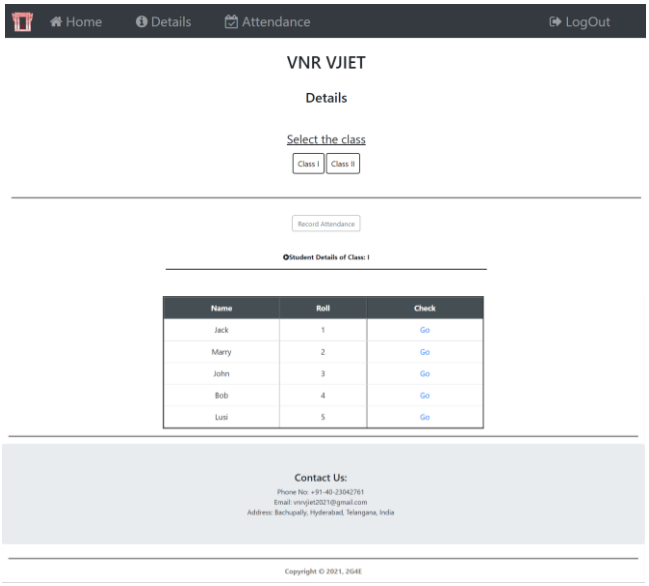

Fig 6: Details Page

successfully logged, we can access the website by clicking the go to database button then attendance page will be opened in the browser.

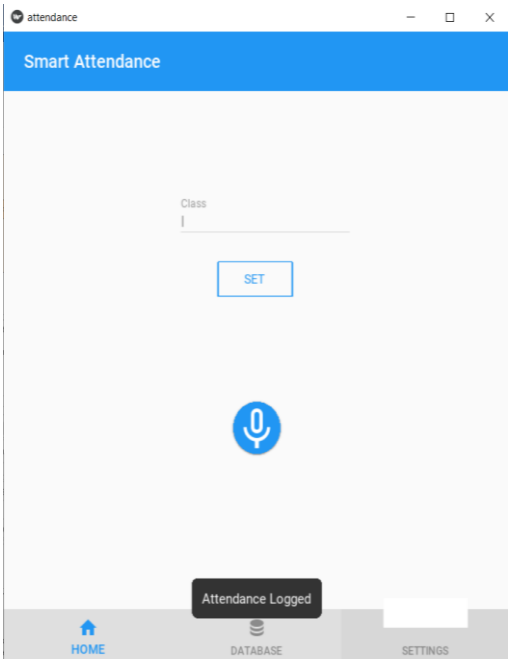

Fig 7: Speech Recognition App

C. *ATTENDANCE PAGE*

Fig 8 is the attendance page of Administrator and Faculty. The navigation bar has a logo on the left side followed by home page, Subjects, Details, Attendance, and logout to the right of bar.

The page has Institute name and buttons to select an option so that student can access his attendance status by date or just view the attendance. It also contains a jumbotron with contact us details and a footer with a copyright.

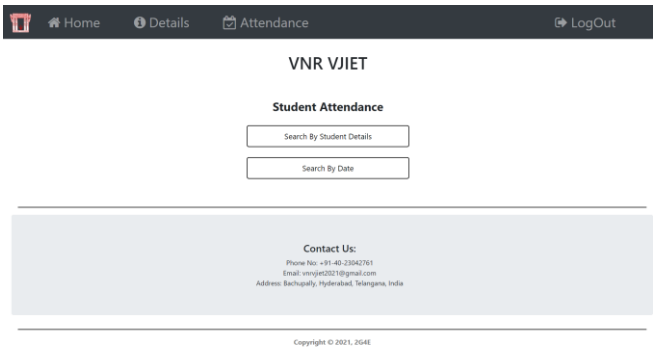

Fig 8: Attendance Page

On selecting Search by Student details, a form with fields Name, Roll Number, Class, Date are displayed on entering the information it redirects with response content as shown in Fig 9.

On submitting it displays a box with the details like Name of the student, Class, Roll Number, Status of Attendance, and Date as shown in Fig 10.

On selecting Search by Date, a form with fields Class, Date is displayed as shown in Fig 11, on entering the information it redirects with response content. The response is displayed in the form of table which contains Name, Roll Number, Class and Status of Attendance as shown in Fig 12.

In Fig 12. We see the final result, Here the roll numbers called out will be marked as present and rest all as absent in that particular section.

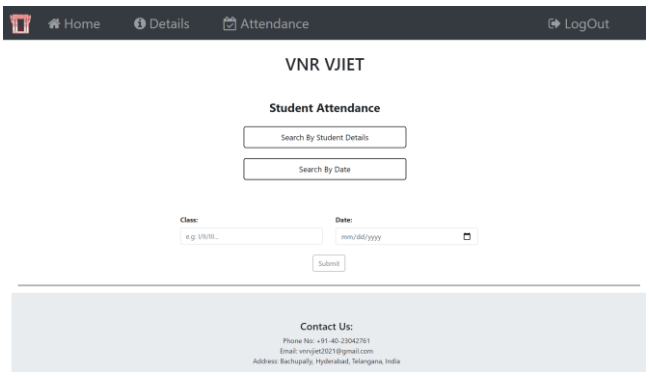

Fig 9: Attendance Page (Search by Student Details)

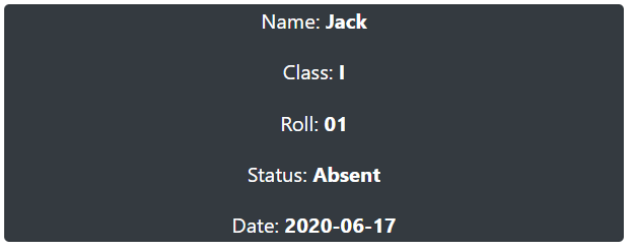

Fig 10: Student Details

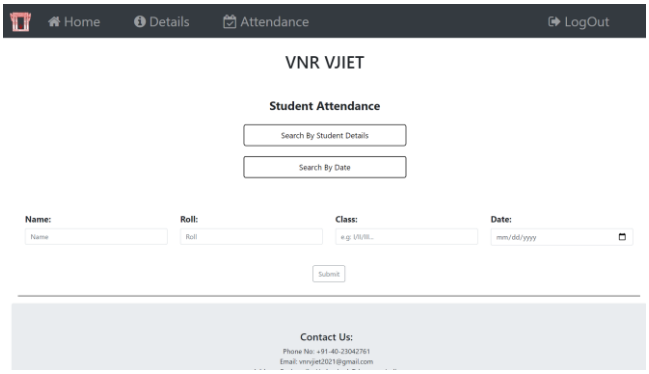

Fig 11: Attendance Page (Search by Date)

Name	Roll	Class	Status
Jack	1	I	Present
Marry	2	I	Present
John	3	I	Present
Bob	4	I	Present
Lusi	5	I	Absent

Fig 12: Student Details on a specific Date

The google based speech recognition has come a long way increasing its accuracy from 20% in 2013 to 95%. It has also succeeded even in case of noisy environment. And also, it is better than manual or supporting researches, they can't match with accuracy of Speech Recognizer of Google API. Fig.13 and Fig.14 are graphical representations. The Fig 12. is the end result of our system and accuracy is calculated in this stage.

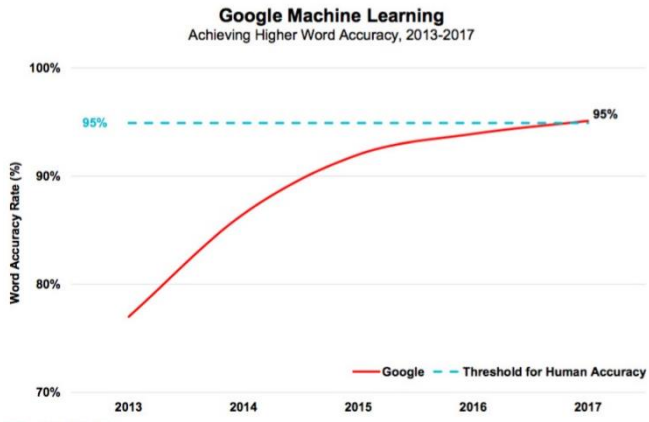

Fig 13: Change in Accuracy

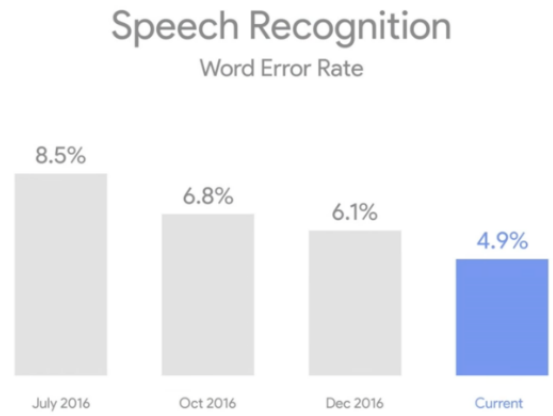

Fig 14: Decrease in error rate

V. CONCLUSION

Manually taking attendance is the traditional way. It takes a long time and is insecure, making it inefficient. Instead of taking student attendance manually, Smart Attendance employing a speech recognition technology is a more efficient way that saves time for teachers. Its ability to take attendance for each person based on their vocal input simplifies and speeds up the procedure when compared to the traditional way. Students must provide voice as input; if any invalid input is recognized, attendance will not be recorded due to authentication failure. As a result, we were able to achieve our desired outcomes with the help of an automatic attendance system, saving a significant amount of productive time. We don't even need any unusual hardware to carry out this procedure. This strategy simplifies attendance management and ensures that attendance is taken accurately. Students, faculty, and administrators can use the website we built to view student attendance based on numerous filters such as a specific class, a specific subject, a certain date, a specific student, and so on. The website allows for simple attendance tracking as well as less paperwork, which saves time and money. It generates several forms of class or student attendance reports automatically. It protects users' privacy by giving them permissions based on their roles.

VI. FUTURE SCOPE

Its capacity to individually identify each person based on their voice input can be expanded further, making the process of granting secure access easy, faster, and more secure than the traditional technique. This can be expanded and utilized in a variety of departments. It would be beneficial to management, for example, in determining professor compensation based on attendance. It could also be beneficial in government workplaces with many elderly staff. They can utilize this model for attendance even when they have lost their fingerprints.

We can also expand it by creating a smartphone application for employees and a PC application for administrators. The date, time, unique number of Android systems, smartphone number, and GPS (Global Position System) coordinates will be communicated to the database server via the smart phone,

along with the employee's fingerprint. Before delivering the information, the employee must first log in to their account. Voice recognition or fingerprint recognition can be used for the login or authentication procedure.

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REFERENCES

[1] Benfano Soewito; Ford Lumban Gaol; Echo Simanjuntak; Fergyanto E. Gunawan Smart mobile attendance system using voice recognition and fingerprint on smartphone-2016

[2] Md. Nasir Uddin, MM Rashid, MG Mostafa, Belayet H, SM Salam, NA Nithe, MW Rahman & S Halder Development of Voice Recognition for Student Attendance-2016

[3] Srinidhi MB, Romil Roy A Web Enabled Secured System for Attendance Monitoring and Real Time Location Tracking Using Biometric and Radio Frequency Identification (RFID) Technology-2015

[4] Talmor, Eli Talmor, Rita Talmor, Alon Wo2002023796 - A Biometric-Based System And Method For Enabling Authentication Of Electronic Messages Sent Over A Network-2002

[5] Xiong Wei1, Anupam Manori2, Nandgopal Devnath3, Nitin Pasi4, and Vivek Kumar QR Code Based Smart Attendance System-2017

[6] Prashik S. Bhagat, Prof. D. S. Shilwant, Prof. S. P. Kharde, Praful S. Bhagat, Abhijit S. Andure, Prof. Amol A. Shirsath Iris based attendance system-2015

[7] R. Umar Faizel Amri[1], Nik Nur Wahidah Nik Hashim[1] and Noor Hazrin Hany Mohamad Hanif1 Speech-based Class Attendance-2017

[8] A. Jain, A. Ross and S. Prabhakar, Fingerprint Matching Using Minuate and Texture. International Conference on Image Processing. pp. 282-285, Greece, Oct 7 - 10, 2001.

[9] A. K. Jain, L. Hong, S. Pankanti, and R. Bolle, An identity authentication system using fingerprints. Proceedings of the IEEE, vol. 85, no. 9, pp.13651388, 1997.

[10] Nandgopal Devanth, Nitin Pasi Biometric-Based Attendance Tracking System using Voice Sensor-2019

[11] Jeetvan Shah, Vikas Salunkhe, Jitendra Saturwar, Omkar Parab Voice Input based Attendance System-2020

[12] O. Shoewu and O. A. Idowu, Development of Attendance Management System using Biometrics. The Pacific journal of Science and Technology. Volume 13, Number 1, May 2012.

[13] S. Rao and K. J. Satoa, An Attendance Monitoring System Using Bio-metrics Authentication. International Journal of Advanced Research in Computer Science and Software Engineering. Volume 3, Issue 4, April 2013.

[14] Josphineleela. R. and M. Ramakrishnan, An Efficient Automatic Attendance System Using Fingerprint Reconstruction Technique . International Journal of Computer Science and Information Security, Vol. 10, No. 3, March 2012.

[15] F. Masalha and N. Hirzallah, A Students Attendance System Using QR Code. International Journal of Advanced Computer Science and Applications, Vol. 5, No. 3, 2014

[16] Manoharan, Samuel, and Narain Ponraj "Analysis of Complex Non-Linear Environment Exploration in Speech Recognition by Hybrid Learning Technique" Journal of Innovative Image Processing (JIIP) 2, no. 04 (2020): 202-209.

[17] Kousar Nikhath A., Sailaja N.V., Vasavi R., Vijaya Saraswathi R. (2021) Road Traffic Counting and Analysis Using Video Processing. In: Satapathy S., Bhateja V., Janakiramaiah B., Chen YW. (eds) Intelligent System Design. Advances in Intelligent Systems and Computing, vol 1171. Springer, Singapore. https://doi.org/10.1007/978-981-15-5400-1_62.