

AN IoT BASED SMART ENVIRONMENT FOR CLASSROOMS

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Abstract

Classrooms are learning spaces which are found in educational institutions of all kinds, from preschools to universities. The refining classroom based activities like real time based attendance monitoring and creation of a Knowledge base are very important. Taking the accurate attendance of students at each classroom and keep it on record is a uphill battle. Today, all teachers are taking the presence of students manually and mark it on paper. And finally they enter data in the computer. So, this paper deals with a smart real time RFID based attendance monitoring system. After each hour corresponding teacher of each classroom will get the SMS alert of attendance through IoT. In addition with that a Question answering system is also introduced here. The creation of a huge knowledge based system is a difficult task. So in order to avoid such condition a Question answering system is implemented by using Artificial intelligence. So students as well as teachers can clarify their doubts using this Question answering system. The system will accept the user query using Amazon alexa Voice Service and process the speech and reply to the user with a relevant answer from Amazon webservice. So this type of question answering system is very helpful to blind students and students can save the time without typing it on keyboard. And also students can train the knowledge base according to their needs. Raspberry pi is used as the Central controller for the system. Thus the environment of a classroom changes to Smart through IoT.

Keywords

Artificial Intelligence (AI), Knowledge Base, Internet Of Things (IoT), Radio Frequency Identification Device (RFID), Short Message Service (SMS).

I. Introduction

Most educational institutions' authorities are bother about the student irregular attendance. In today's world accurate attendance of students have a great importance. Truancies can affect student overall academic performance. The normal method of attendance tracking by calling names or signing on paper is very time consuming and insecure, hence inefficient. Our new Time and attendance that also called RFID attendance system using IoT, IR sensor, RFID tag is one of the solutions to address this problem. This system can be used to take attendance for student in school, college, and university. It also used to take attendance for Teacher, Staff and other Employee. Its ability to uniquely identify each person based on their RFID [6] tag type of ID card make the process of taking the attendance easier, faster and secure as compared to conventional method. Students only need to place their ID card on the reader and their attendance will be taken immediately. With real time clock capability of the system, attendance taken will be more accurate since the time for the attendance taken will be recorded.

A knowledge-based system (KBS) is a computer program that reasons and uses a knowledge base to solve complex problems. The term is broad and is used to refer to many different kinds of systems; the one common theme that unites all knowledge based systems is an attempt to represent knowledge explicitly via tools such as ontology's and rules rather than implicitly via code the way a conventional computer program does. A knowledge based system has three types of sub-systems: a knowledge base, an user interface and an inference engine. The knowledge base represents facts about the world, often in some form of subsumption ontology. The inference engine represents logical assertions and conditions about the world, usually represented via IF-THEN rules.

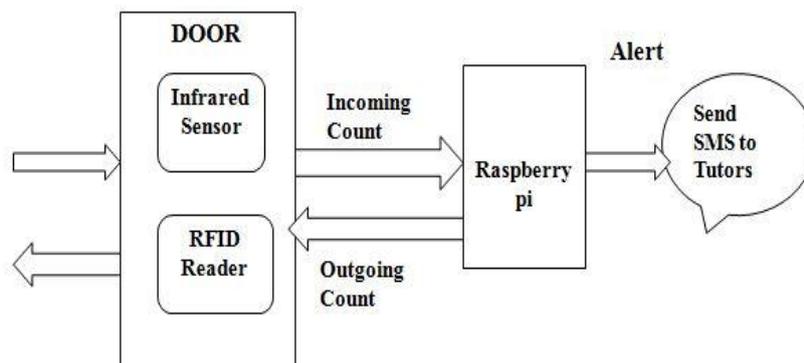
Recently googling, referring books and browsing are the key sources for finding answers or to gain information. This is a complicated task as it requires time and doesn't provide correct answers. The system mentioned here is a smart automatic answering machine that provides answers in speech as well as in text. It is also known as personal virtual assistant. This knowledge based search engine is brought into life using the Bing search engine and AWS (Amazon Web Service) in addition with Raspberry Pi. Speech to Text and Text to Speech are the other main technologies used with artificial intelligence. Speech recognition capability of this system makes searching information more easy. The main aim of this system is to assist a person in their never ending quest for information. The system described here preserves all the functionalities such as tasks and services for an individual and is hence called "An Intelligent Personal Assistant".

II. Methodology

Actually the objectives of the project are divided into two modules. The module one is Real Time Based RFID Attendance System and the module two is Question Answering System. After implementing this the environment of a classroom can be changed to smart.

❖ Module 1: Real Time RFID Based Attendance Monitoring System

Create two LISTS (Data structure) in python to store the name of students and their RFID Tag no. Adjust the time schedule in the code. Suppose the schedule for each hour is 1 hr. So a student can be late up to 15 minutes. All the students and staffs have a RFID tag which contains a unique identification number. Two infrared sensors and RFID reader are fixed at the door of the classroom. When each student enters into the classroom an infrared ray will cut which emits from the IR sensor. Based upon the ray cut count of the students will be recorded. In order to avoid the misuse of RFID tags, RFID reader can read tag, up to the incoming count. Each student and corresponding tutor will mark their attendance by swiping the RFID tag on a RFID reader. The reader will read the tag unique number, then match it with the LIST details and record the attendance of each hour and send to corresponding tutors through IoT. So when an hour starts a student can take up to 15 minutes late and after this 15 minutes the attendance of that hour will be closed. Then a continuous monitoring of the attendance at each hour will be recorded by using the ray cut of the IR sensor. That is, if a student marks his attendance and supposes he wants to go outside the class before the hour complete for a genuine reason then system mark it as a genuine trespass by swiping the RFID tag and ray cut. Otherwise system takes it as fake trespass. That is student give attendance but not attend the class without valid reasons after each hour the corresponding tutor will get a SMS message which contains the following details. They are Present, Genuine trespass, Fake trespass. Based upon this message a tutor can mark the attendance and final decision about marking the attendance of student is belong to the tutor. And by using PIR sensor on Fan, System can automatically turn on and turn off the Fan by detecting the human presence.



❖ Implementation: Real Time RFID Based Attendance Monitoring System

- Hardware Requirements: RFID Tags, RFID Reader, Infrared Sensors, Raspberry pi, LCD Monitor etc.
- Software Requirements: Python
- First Set the Time Table Schedule of each classroom.

- Create an account at Twilio cloud platform in the name of each tutor mobile number of each classroom for sending the attendance alert of corresponding hour.
- Twilio is a cloud platform which allows software developers to programmatically make and receive phone calls and send and receive text messages using its web service APIs.
- Store the details of students in python data type called LIST. Here mainly stores the RFID number and corresponding names of students which are shown below.

```
names = ["AJINA", "AMULYA", "ASWATHY", "ASWINI", "CHINJUPAUL"]
roll_no = ["4A001DE7BB", "4900D50D9A", "4900D50B39", "4900D4D3D5", "4900D51023"]
```

- Connect the Hardware equipments and Switch ON the Wi-Fi (Jio Net).
- Run the python codes in LCD monitor. Eg: cmain.py and rmain.py.
- Cmain.py is the code for swiping the RFID tag and sending the SMS alert, rmain.py is the code for taking the incoming count and outgoing count.
- Here 1 hour =2 minute, and first 1 minute(60 seconds) is for marking the attendance and after that attendance will be close and send the alert to corresponding tutor.
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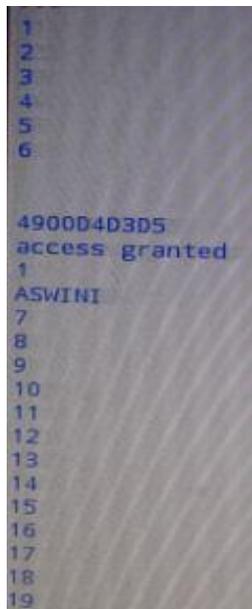


Fig. 1

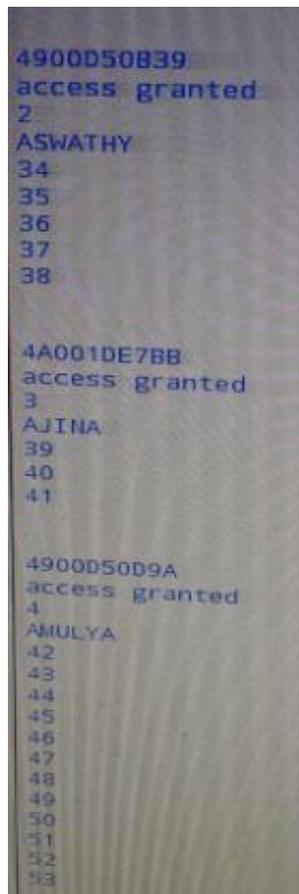


Fig. 2

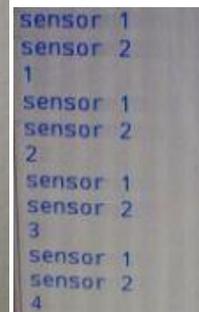
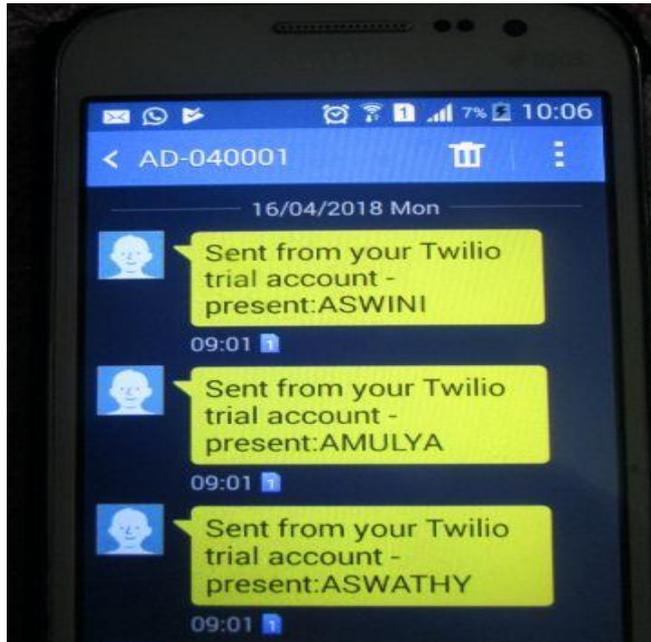
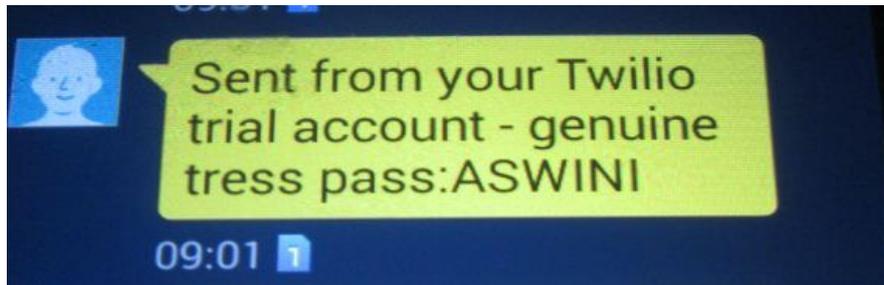


Fig. 3

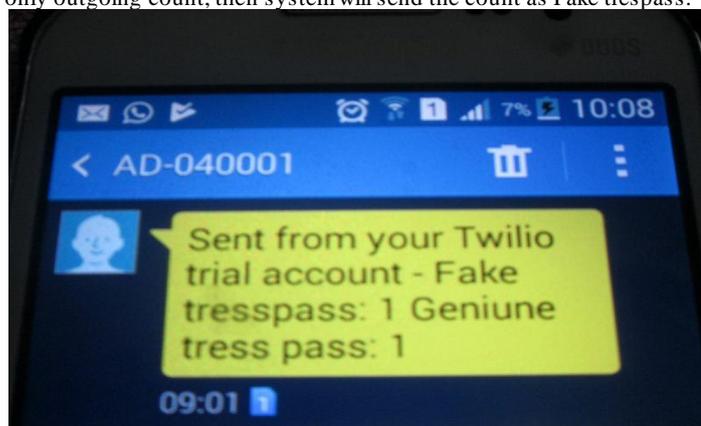
- Then the attendance alert will be send to corresponding tutor in the following manner.



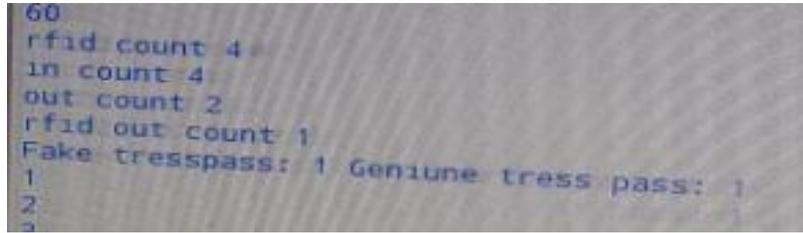
- Then remaining 1 minute is for finding the trespass. So for finding genuine trespass the system take the RFID reading + outgoing count and the send the alert as showed below.



- And if there is only outgoing count, then system will send the count as Fake trespass.



- After the completion of the hour (here 120 seconds) the system will show the following messages on LCD monitor.



❖ *Module 2: Question Answering System*

Mainly Question answering system can be divided into two. They areDomain Specific and without Domain Specific. Domain Specific Question answering system is a system which can train by the students according to their needs. The trained data is stored as a **DICTIONARY** format. The **DICTIONARY** is a data structure in python. It has a **KEY-VALUE** pair format. So, here **KEY** is the Question trained by the students and value is the answer of the corresponding question. Without domain specific question answering system means that, students can ask any type of relevant questions to the system and system will reply with relevant answer by retrieving the information from Amazon web service through bing search engine and scrap the correct answer of the question using local beam search algorithm.

❖ *Implementation: Question Answering System*

- Hardware Requirements: Jio Net, Microphone, USB Sound Dongle card, Raspberry pi.
- Software Requirements: Python.
- Steps For Domain Specific Question Answering System
 - Tell the command “**OPEN GOODVIBE**” to Raspberry pi through microphone.
 - After that, Tell the command “**TELL GOODVIBE QUESTION**”.
 - Then after that system ask a question that “**TRAIN OR NOT**”.
 - At that time, user will tell **YES** and reply with the answer of the question.
 - For the accurate speech to text conversion here use **SVM Classifier** and **Google Speech dataset**.
 - Then this Question and answer will stores in a python dictionary format in Raspberry pi.
 - And, to verify whether the answer stored or not by a command like **TELL GOODVIBE QUESTION**.
 - Then system will reply with the trained answer of that question.
- Steps for Without Domain Specific Question Answering System(Fig. 4)
 - Ask the question in English from any area directly to the Raspberry pi through microphone.
 - Then by using **pocket Sphinx engine**, the query accurately converts in to text.
 - Then this text query is put in to **JSON data frame payload** and send to Amazon web service through bing search engine.
 - Before that user should create a **Amazon web service account**.
 - And by using **local beam search algorithm**, the relevant answer will scrap from the server.
 - And again the text answer will convert in to speech and reply to the user.

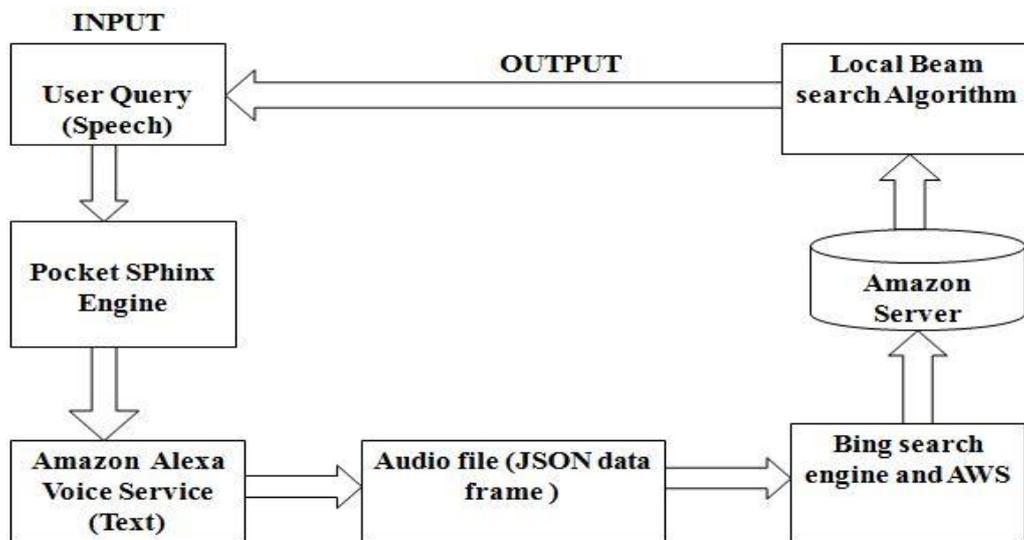


Fig.4

V. Conclusion

Real time based attendance monitoring system helps to get an accurate attendance of students in the classroom at each hour and reduce the effort of tutors .A Knowledge based search engine gives a platform for self learning and it provides justifications for the decisions made, deals with partial and uncertain information, and also provide a friendly interface. Thus the environment of a classroom changes to smart.

References

- [1] Ononiwu G, Chiagozie, Okorafor G. Nwaji. "Radio Frequency Identification (RFID) Based Attendance System with Automatic Door Unit". in Academic Research International, ISSN-L : 2223-9553. 2012; 2(2).
- [2] Zatin Singhal and Rajneesh Kumar Gujral. "Anytime Anywhere- Remote Monitoring of Attendance System based on RFID using GSM Network". in International Journal of Computer Applications (0975-8887). 2012; 39(3).
- [3] Herdawatie Abdul Kadir, Mohd Helmy Abd. Wahab, Zarina Tukiran, Ariffin Abdul Mutalib. "Tracking Student Movement using Active RFID". in 9th WSEAS International Conference, ISSN : 1790-5117.
- [4] Elisabeth Ilie-Zudor, Zsolt Kemeny, Peter Egri, Laszlo Monostori. "The RFID Technology and its Current Applications" in MITIP-2006.
- [5] Mohd. Firdausi Bin Mayodan. "Student Attendance Using RFID System". in University Malaysia, Pahang, May2008.
- [6] Priya Gupta, Surendra Sutar, "MULTIPLE TARGETS DETECTION AND TRACKING SYSTEM FOR LOCATION PREDICTION" International Journal of Innovations in Scientific and Engineering Research (IJISER),vol1 no3,pp127-130,2014.
- [7] S. Stoyanchev, Y. Song and W. Lahti, "Exact phrases in information retrieval for question answering," in Proceedings of the 2nd workshop on Information Retrieval for Question Answering, 2008.
- [8] A. Lampert, "A Quick Introduction to Question Answering," CSIRO ICT Centre, 2004.
- [9] D. Moldovan, S. Harabagiu, M. Pasca, R. Mihalcea, R. Goodrum, R. Girju and V. Rus, "Lasso: A Tool for Surfing the Answer Net," in Proceedings of the Eighth Text Retrieval Conference (TREC-8), 1999.

