

SMART ATTENDANCE AND LOCATION TRACKING USING IoT

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Abstract—This paper presents a smart attendance and location tracking using IoT. Attendance system is used to track the attendance of a particular person. There are many systems for taking attendance, but each has drawbacks, such as the traditional way has a drawback in the data of attendance that list is hard to reuse, a biometric attendance system has a drawback of the existence of human error such as a fingerprint scan is not acceptable, due to the condition of a wet finger, dirty. In this paper, we are using NFC tag with ID card for taking attendance. Also, we will track the location of a person for the specific premises. GPS is used to track outdoor location, but GPS does not give high accuracy in indoor location. So, we are using LoRa technology, which will provide high indoor accuracy.

Keywords---NFC Tag, NFC Reader, LoRa, Raspberry Pi.

1. INTRODUCTION

Attendance system is a system that is used to track the attendance of a particular person and is applied in the industries, schools, universities or working places. The attendance rate is important because students are more likely to succeed in academics when they attend class consistently. It's difficult for the lecturer and the class to build their skill and progress if a large number of students are frequently absent. The traditional way for taking attendance has drawbacks which is the data of the attendance list is hard to reuse.

In this research, we will incorporate NFC technology and LoRa technology concept. NFC stands for Near Field Communication. NFC is a wireless short-range communication Technology (4cm). Communicate with two enable NFC devices using emitting the Radio waves. NFC device generates radio frequency in 13.56MHz spectrum. The principle of magnetic induction coupling is used to send and receive data within close proximity. It will use Active device and Passive device.

Active device-

Active device means External power supply required.

Passive device-

- Does not require any external power supply.
- Powered by electromagnetic field of Active device.

GPS is used to track outdoor and indoor location, but GPS does not give high accuracy in indoor location. So we are using LoRa technology, which will provide high indoor accuracy.

So this tracking is generally focusing on Location Tracking which is associated with the Grid Technology. Basically, it will be used for tracking the geo-location of humans for specific premises. So for these premises we are going to design our own map instead of using GPS or Wi-Fi. And for tracking we are using the latest emerging technology (LoRa) which will work without using the internet.

Basically LoRa means (Long Range) which is a low-power wide-area network protocol. It enables long-range transmissions with low power consumption. LoRa is based on chirp spread spectrum modulation, which has low power characteristics like FSK (Frequency shift keying) modulation but can be used for long range communications.

2. LITERATURE SURVEY

RFID is used to recognize the tags when its holders entered the place area, however photo-cells will help to determine if there are really persons passed through the system or not so help to determine direction. RFID system shows the good efficiency and performance and provides an advantageous method of attendance marking compared to the traditional method of attendance system [1]. Mobile attendance system with NFC and face authorization to add security feature using Raspberry Pi and store the data and cloud. Application is integrated with cloud-based web application. Parents can know their children do not skip lectures through the web application, for faculty staff can view student attendance report [10].

The design and experiment of incorporating the GPS and GSM network partitioning technology to deliver a location-based service for tracking and detecting human. In this study, GPS and GSM feature were utilized to emulate the tracking and detection process. The purpose of this study is to share this information with other researchers and to foresee ways to improve the current processes hence the same study can be initiated and explored by others [3]. In the last 2 decades, tremendous efforts as well as significant progress have been made in various aspects of mobility management in a wide variety of wireless networks, such as cellular system, wireless internet, wireless LAN, GPS, Wi-Fi, Bluetooth technology, has further led to sophisticated mechanisms

for location sensing and location-based services [11].

Access find location is used because GPS providers determine the location of user using satellites. For this, GPS coordinates are obtained and used for positioning. The GPS receiver on the smart phone receives signals from the satellite. These signals are processed and the exact location is determined. It takes more time for response and causes delays in location determinations. Location accuracy is consistent with the accuracy of Google Maps, since the app uses the SDK from Google Maps that provides GPS users with satellite locations work better outdoors-direct sky/satellite view and communication going on as for network providers, network providers determine the location of users using cellular towers [4].

3. EXISTING SYSTEM

In current system attendance taken by manually data of attendance that is hard to use, a biometric attendance system has limitations of the existence of human error such as a fingerprint scan are not acceptable, due to the condition of a wet finger, dirty. Also RFID are used for attendance. Currently, GPS and GSM technologies are used for location tracking which has certain limitation.

Limitation-

- Need to carry a backup map & direction.
- Sometimes you may need an external power supply.
- GPS signals are not accurate due to some obstacles.
- Misuse of RFID card.
- Inaccuracy GPS devices rely upon receiving signals from at least 4 satellites.

4. PROPOSED SYSTEM

In the proposed system, will mark the attendance using NFC so it will reduce paper usage and time efficiency. We will use a NFC tag inbuilt in Identity-Card for students. By using this we will mark attendance of students. Attendance record of each student with the lecture is stored on server. The steps in the proposed system are as follows: -

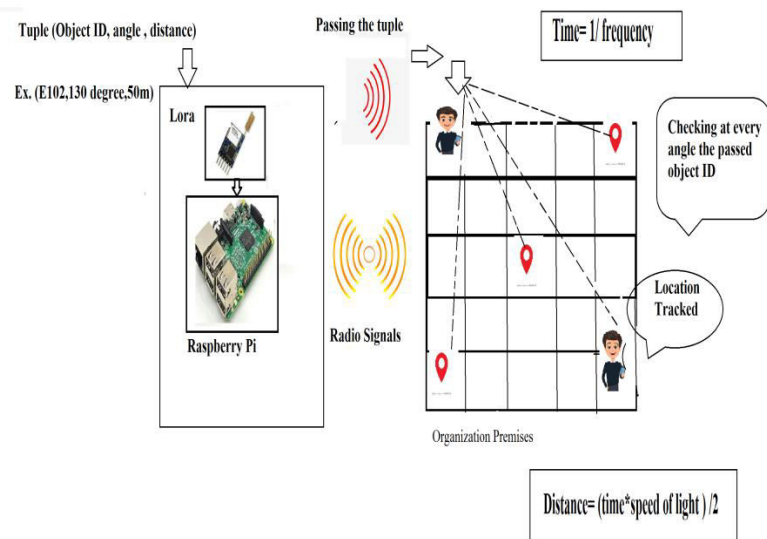
- Lecturer will login in the application using his/her username and password. After successful login lecturer will set class time and duration for the attendance record and lecturer can activate present student roll no.
- After that a student scans card then attendance is stored in database.
- As lecture ends the lecturer will close the application.

So the working of location tracking will be like, if employee is entering in his organization so that his specific ID is already saved in the database his attendance will be marked that he is present in the organization premises. So consider the manager wants an employee but he is not reachable so in that way using our device he can easily track that where the employee is present in the organization premises.

So consider the manager wants an employee but he is not reachable so in that way using our device he can easily track that where the employee is present in the organization premises. So we are using the lora technology. The Lora module will be mounted at the premises entrance with a microcontroller so it can cover the entire area of the organization and each employee has an ID card which has lora tag on it along with a unique ID and these tags will be connected through the GP/IO pins to the Raspberry pi.

When the manager wants to find an employee, then here comes the task of lora. The lora device will start emitting radio signals around all the grids in the premises. We will capture frequency from these radio signals. Then we will calculate the time 't' using this frequency by the formula, $Time = 1/frequency$. Then we will calculate the distance by the formula, $Distance = time * speed\ of\ light / 2$.

After that we will pass a tuple which consists of (object, angle, distance) where the object is the unique ID of an employee and as we have considered our premises as 360 degree so the angle from which we are getting the response will be from the tags and this will be the angle and distance that we have already calculated. So by this we will know in which grid the employee is present and in this way his location will be tracked without the help of the internet. This data will be saved on the cloud for security purposes. We can check this data through a desktop application or an android application or else on LCD display.



System Architecture

5. ALGORITHM

Step 1: Start

Step 2 : LoRa device send radio signals to specific id.

Step 3: We get frequency from radio signals.

Step 4: Calculate time using frequency.

$$\text{Time} = 1/\text{frequency}$$

Step 5: Calculate distance using time and speed of light.

$$\text{Distance} = \text{time} * \text{speed of light} / 2$$

Step 6: Then we pass one tuple (object, angle, distance)

Step 7: We get actual location using this tuple.

Step 8: End

6. CONCLUSION

In this way we will develop a system which will mark the attendance of the student and will track their location of them for the specific premises. This system will be more useful in education sectors where schools and colleges can use it to keep a track on their students in the campus.

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