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Research paper



A mobile application using IoT enabled navigation system for bus riders

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Abstract

A bus rider often faces the problem of losing track with the bus timing and position. Towards the goal of making it easy for the student boarding college buses, we make use of the Internet of Things (IoT) technology. It provides the following services for the bus users: 1) location and progress information of the required bus 2) tracking nearby buses and 3) automatic attendance registration of the bus. With this system, we describe various challenges and a few potential solutions such that the bus riders feel more convenience with this integration of Internet of Things (IoT) to transport services.

Keywords: *Internet of Things; Global Positioning System Tracking; College Bus.*

1. Introduction

Nowadays usage of mobiles has increased to a larger extent. The main objective is to present an insight into a system that is implemented for urban college buses, an Internet of Things enabled navigation system for those boarding college buses. The important feature is bus tracking, which helps to track the location of the bus [1].

The aim is to create an application which helps to track the college buses in real time. First whenever the students need, they can log-in the mobile application give their bus details and view the bus location based on which the distance of the bus can be calculated. The second application is to search for other nearby buses in case of emergency this feature would be available for the bus drivers [2]. The third application is automatic entry registration for the buses where in a notification is sent to the admin when the bus reaches the college premises.

In the current scenario there is no application for college bus. All the works related to it are done manually. There is no means to track the bus in real time except for calling the bus driver and asking. The students would have to follow the schedule which is given for them to catch a bus. Also, there is no system to find the nearby buses in case of any emergency such as breakdown. The bus entry is also performed in a traditional manual method using paper and pen. The disadvantages of existing system are No option to view nearby buses and manpower support required for registering bus entry.

The proposed system is an IoT based Mobile application which only requires a single time sign-in. We encourage some specific commuters (like the bus driver) to install the mobile application which avoids collision and includes the accuracy for tracking the particular bus. Additionally, in case of emergency the nearby buses can also be viewed. The entry of the buses inside the campus premises is also sent as a notification to the administrator which helps to keep track of the buses[6].

The advantages of proposed system are:

- Automatic bus registration, No Manpower required for registration.
- In case of emergency the nearby buses can be viewed.
- The entry of the buses inside the campus premises is also sent as a notification to the administration which helps to keep track of the buses.

2. IOT

Internet of Things (IoT) is an system of connected physical objects that area unit accessible through the web. The ‘thing’ in IoT can be an individual with a cardiac monitor or an automobile with built-in -sensors, i.e. objects that are allotted an internet protocol address and have the power to gather and transfer information over a network without manual help or intervention. The embedded technology within the objects helps them to act with internal states or the external surroundings, that successively affects the selections taken [10].

The Internet of things (IoT) is that the inter-networking of physical devices, vehicles also said as connected devices and smart devices, buildings, and alternative things embedded with physics, software, sensors, actuators, and network property that change these objects to gather and exchange information. IoT got outlined as a global infrastructure for the data society, sanctioning advanced services by interconnecting physical and virtual things supported existing and evolving practical data and communication technologies and for these functions a thing is an object of the physical world physical things or the data world virtual things, that is capable of being known and integrated into communication networks. The IoT permits objects to be perceived or controlled remotely across existing network infrastructure, making opportu-

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nities for additional direct integration of the physical world into computer-based systems, and leading to improved potency, accuracy and economic profit additionally to reduced human intervention [9].

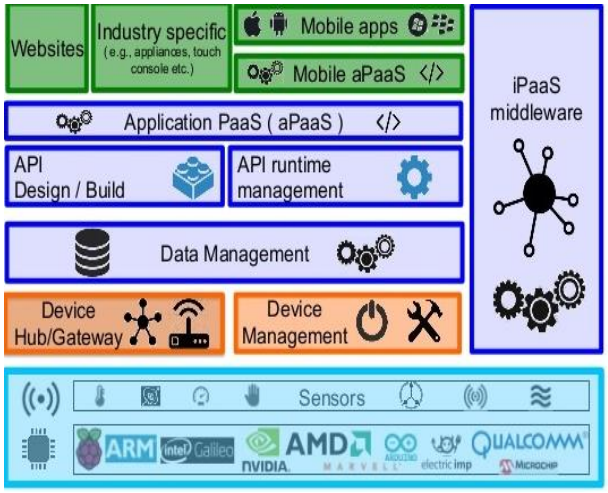


Fig. 1: IoT Architecture.

3. System description

System design is the abstract model that defines the structure behavior and a lot of views of the system. A design could be a formal description and or an illustration of a system organized in a manner that supports reasoning regarding the structure and behavior of the system.

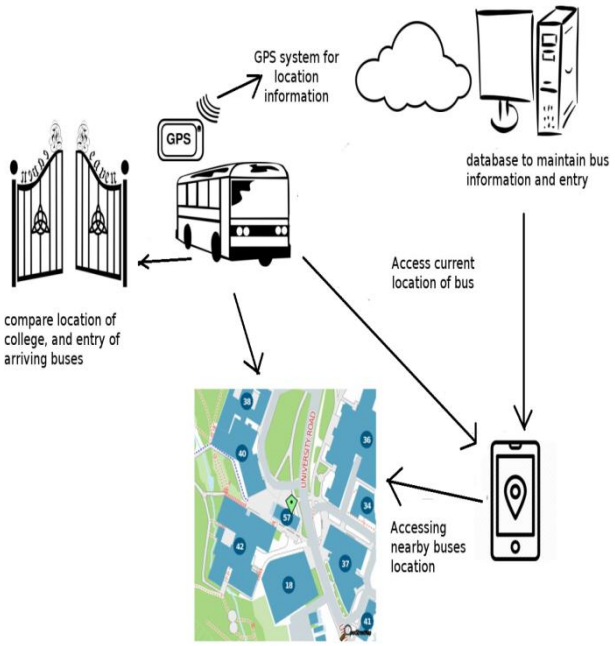


Fig. 2: System Architecture.

4. Modules design

a) List of Modules
1) Tracking the bus
2) Finding the nearby buses
3) Automatic bus entry

b) Module Description

Tracking the Bus

The main objective of this module is that, when a student logs in the android application he must be able to view the exact location of the bus and approximately calculate the duration it would take to reach his/her stop. A GPS is used to accomplish this. Using IoT the current latitudinal and longitudinal position of the bus is found which is then fed into the google maps API in the application. Hence one can know the distance between the bus and their stop.

Finding the Nearby Buses

This module involves finding nearby buses in case of emergency (such as break down). The android application finds the GPS location of the other buses and calculates their distance based on the location to find the nearest buses. This works when the user logs in and presses the tab to find the nearby in his android application.



Fig. 3: Finding Nearby Buses.

Automatic Bus Entry

This is the third module where it depicts, when the college bus enters the it's premises gate, a notification sent to the administrator mentioning the time of the entry of bus into the college premises. This is again done with the help if GPS where the college gates location is got in latitude and longitude format and the GPS are programmed accordingly.

5. Experimental results

a) Testing

Testing has been done to verify whether the system meets the user's requirements. In this paper, the purpose of testing is to make ensure that the system is accurate and efficient for user actions.

In unit testing phase, we will be testing each individual module separately and then integrate with the overall system. Unit testing focuses on very minute units of software design for its verifications with greater efforts with same efficiency through the module in its unit testing phase. This can be also said as module testing, as, the modules of the system are tested separately.

This testing is carried out during programming stage itself. In this testing process, each module found to work satisfactory as regard to the expected output from the module.

In integration testing phase, any one of the module might have adverse effect on the any other sub functions. So, when we try to combine, it may not end up with desired functions production.

The testing is done with sample data only. The need and purpose for the integrated testing is to determine the overall system performance and accuracy.

In output testing phase, the testing can be done to verify whether the system producing the desired output in required format. The output testing refers to the perfection of the retrieval operation. The retrievals which we got will be perfectly implementing the BDEE and GK algorithm. So, the result of the output testing will not affect the change or correction in the developed system.

The phase of testing its performance will be under performance testing by installing our application in various versions of android mobiles. Working and performance level of our applications is

similar in all the versions of android. In spite of the versions our applications is flexible and user friendly.
The acceptance of the user is acknowledged by the known researchers tested the modules and their suggestions were taken in account before submitting this paper.

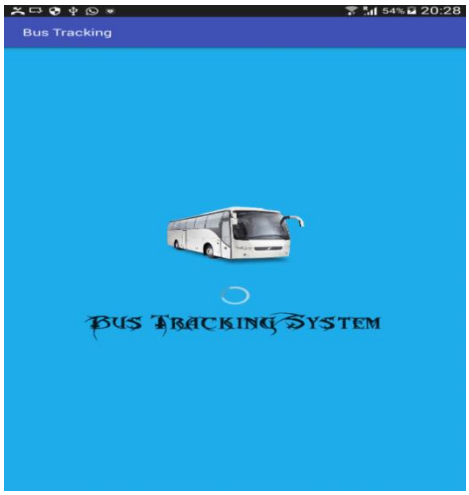
b) Maintenance

Software maintenance in software engineering is the modifications of a software product after delivery to correct faults, to improve performance or other attributes. A common perception of maintenance is that it is merely fixing bugs. This perception is perpetuated by users submitting problem reports that in reality are functionality enhancements to the system.

Table 1: Represent the Unit Testing of the Modules Circular, Bus Tracking and Login

Test case Name	Input	Actual Value	Expected Value	Result
Previous button in circular	Pressed previous button when circular no is 1	No action take place	No action taken, remains the same screen	No Error
Incorrect bus Selection	Click the "Select a bus" item and pressed Search	Display a Message of select a bus	Display some error message and solution to rectify it	No Error
Login Page	Incorrect username or password entered	Display a error message and ask to sign in	Display a message and ask to sign in	No Error

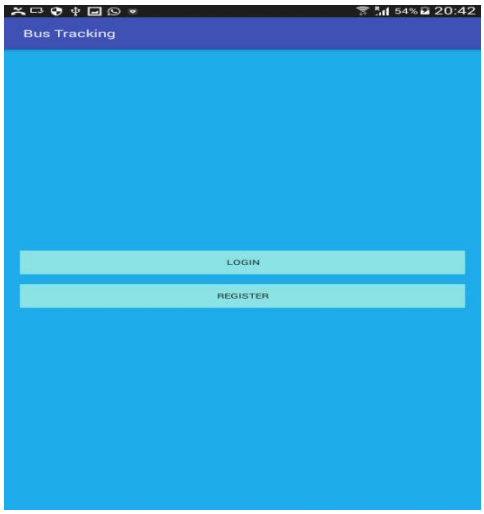
c) Screenshots



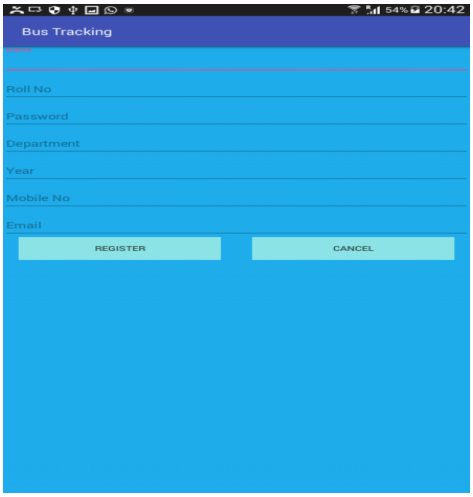
App Screenshot 1: Front page



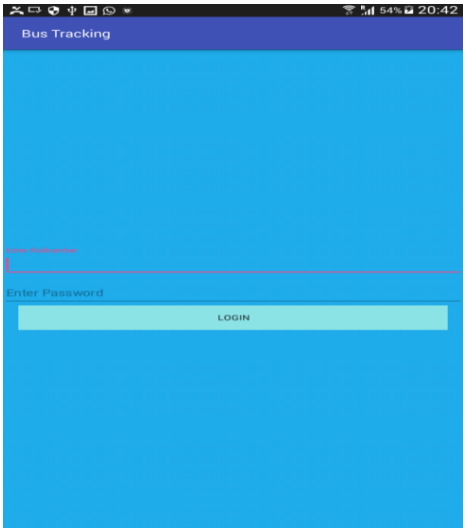
App Screenshot 2: Tabs



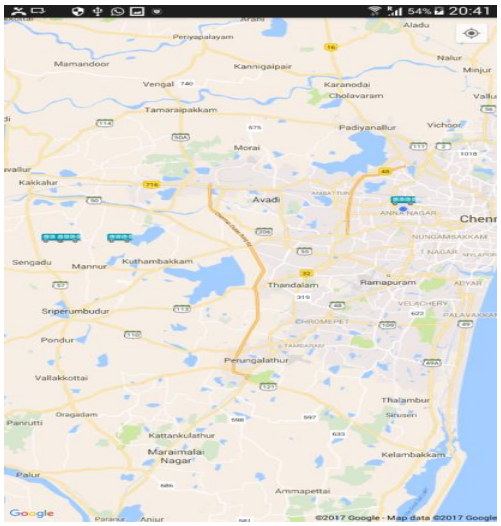
App Screenshot 3: Student Login and Register



App Screenshot 4: Student Registeration Form



App Screenshot 5: Student Login



App Screenshot 6: Other Buses

6. Conclusion and future enhancement

With this system, we describe various challenges and a few potential solutions such that the bus riders feel more convenience with this integration of Internet of Things (IoT) to transport services. This android application would essentially be of a great help to the bus riders as it would give ease in the transport commute and additionally provide the capability of viewing the buses which is often late or ends up and trouble so that steps can be taken to rectify it.
As of now, the system only shows the bus location when we login we can have an alarm system which gives a notification when the bus first starts from its rest point. We have implemented our system in android platform, but in future we will make this application work in all platforms.

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