Smart Bus Tracking System

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Abstract- *Due to the rapid increase in population there is need for efficient public transportation system. In this case waiting for the buses is not reliable. Most of the people who rely on the public transport has a major concern about the real time location of the bus for which they are waiting for and the time taken to reach their bus stop. If this information is periodically updated to them it helps people in making better travelling decisions. This project SBMS comprises integration between hardware and software. SBMS uses Arduino UNO to control the GPS module to get the geographic coordinates. The users will also be able to view position of the bus on a digital mapping from Google Maps using their smart phone application and webpage. SBMS is portable, low cost system that supports people for the efficient transportation.*

Keywords- GPS, Arduino, Google Maps, Chatbot, SBMS

I. INTRODUCTION

With the advent of GPS and the ubiquitous cellular network, real time vehicle tracking for better transport management has become possible. These technologies can be applied to public transport systems, especially buses, which are not able to adhere to predefined timetables due to reasons like traffic jams, breakdowns etc. The increased waiting time and the uncertainty in bus arrival make public transport system unattractive for passengers. Our smart bus management system (SBMS) uses a variety of technologies to track the locations of buses in real time and uses this information to generate predictions of bus arrivals at stops along the route. When this information is disseminated to passengers by wired or wireless media, they can spend their time efficiently and reach the bus stop just before the bus arrives, or take alternate means of transport if the bus is delayed. They can even plan their journey long before they actually undertake them. This will make the public transport system competitive and user-friendly. The use of private vehicles is reduced when more people use public transit vehicles, which in turn reduces traffic and pollution.

1.2 OBJECTIVES OF SBMS

The objectives of this project are:

- To create an application which is able to estimate and predict the arrival time of public transportation to passengers by taking traffic congestion factor into consideration.
- To offer a convenience mobile information service which ensures passengers are able to organize multiple personal daily planning efficiently.
- To offer a mobile information service which can assist passengers to eliminate the waiting time for the arrival of bus at a possibly unpleasant or unsafe bus stop. To make more accessible and constantly updated dynamic bus information to bus passengers.
- To offer cost effective mobile information service to bus passengers via SMS (Short Message Service).

1.3 SBMS IN NETWOKING

For making the entire system of SBMS, more accessible, we targets on mobile phone which is equipped with SMS (Short Message Service). As, SMS is significantly recognized as a user friendly and essential communication tool and sufficient enough to communicate with the system which will boost the productivity of the service well. The artificial intelligence technology called chatbot has been implemented. And it is created in facebook to create a facebook page. This chatbot integrated with the gps system has been installed in all the vehicles of the organization. The output of the gps integrated with the google maps so that the user can have a live tracking of the required vehicles in google maps. Thus the GSM with GPRS module is used for uploading the data from GPS to the google map which can be retrieved by chatbot.

II. SBMS COMPONENTS

1. Global positioning system
2. Arduino UNO
3. Google maps API
4. Chatbot
5. facebook page
6. GSM
7. GPRS

2.1 GPS

GPS stands for global positioning systems. The U.S government department of defense forces in the early 1970's initialized it, but later in the early 1990's it was made free for the civilian to use. Although up to date, the U.S government still does the repairing and maintenance of GPS satellites. Honda designed the first GPS (navigation system) in 1983. Pioneer claims to be the first with a GPS-based auto navigation system, in 1990. Magellan claims to have created the first GPS-based vehicle navigation system in the U.S in 1995. Each GPS (satellite) transmits data that indicates the current time and its location. It transmits signals to a GPS receiver. These receivers require an unobstructed view of the sky hence they can only be of effective use outdoors. The GPS has been used to find the live location of the vehicle.

2.2 Arduino Microcontroller

The Arduino mega 2560 is a microcontroller board based on the ATmega2560.It has 54digital input/output pins (of which 14 can be used as pwm outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a16 MHz crystal oscillator, a USB connection, a power jack, and a reset button.

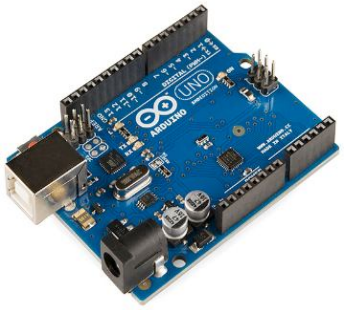

Fig.1 Arduino UNO

It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The reasons of using the Arduino board which comes with ATmega168 or 328 for easy interfacing with the GPS and GSM module and for easy programming (in C) of the microcontroller. The Arduino boards come with a library for interfacing with module and for dealing with analog or digital inputs and outputs.

2.3 Google maps API

Google maps API were the Application Programming Interface will integrate the GPS output with the google maps. The API's will take the output of the GPS module as input to it and it will show the live location of the vehicle when the button in the chat bot is clicked by the user. This google maps API is the backend connector for the input and the output in the google maps.

2.4 Chatbot

Chatbots can be thought of as the spokesperson for artificial intelligence (AI). It is also known as talkbot or chatter bot. Chatbots such as ELIZA and PARRY were early attempts at creating programs that could at least temporarily fool a real human being into thinking they were having a conversation with another person. Chatbots can be stateless or stateful. A stateless chatbot approaches each interaction as if it was with a new user. A stateful chatbot is more sophisticated; it can review past interactions and frame new responses in context. Adding a chatbot to a company's service or sales department today requires little coding, because there are a number of chatbot service providers that allow developers to build conversational interfaces for any business application

2.5 facebook page

The chatbot will be integrated with facebook. The integration will be done by attaching the chatbot to the messaging part of a facebook page. The facebook page should be followed by the user in order to get the current and live locations of the vehicle of the organization that he may need. The chatbot will be given practice using machine learning technology via facebook message and the artificial intelligence of the bot will give the necessary information about the vehicle via message only. Thus the user should click the buttons in the facebook messaging page of the facebook page which will be given as the input to the chatbot.

2.6 GSM

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone.When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.

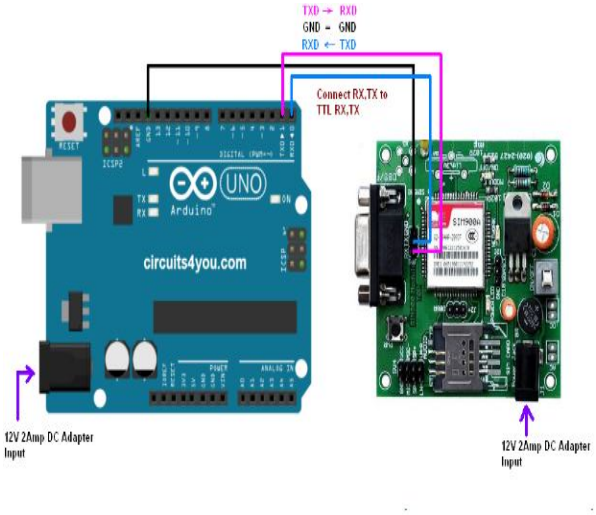

Fig.2 Arduino with GSM

2.7 GPRS

GPRS or General Packet Radio Service is an extension of the GSM Network. GPRS is an integrated part of the GSM Network which provides an efficient way to transfer data with the same resources as GSM Network. Originally, the data services (like internet, multimedia messaging etc.) in the GSM Network used a circuit – switched connection. In this type, the access time for the network is long and the charges for the data were based on the connection time. Also, this type of connection is not suitable for transmitting bursts of data. With the integration of GPRS, a packet – switching based data service, in to the GSM Network, the scene of data services has changes. In GPRS based packet – switching networks, the user device doesn't hold the resources for a continuous time but efficiently uses a common pool. The access time in GPRS is very small and the main advantage is that it allows bursts of data to be transmitted.

III. DEVELOPMENT OF SBMS TRACKING MODULE

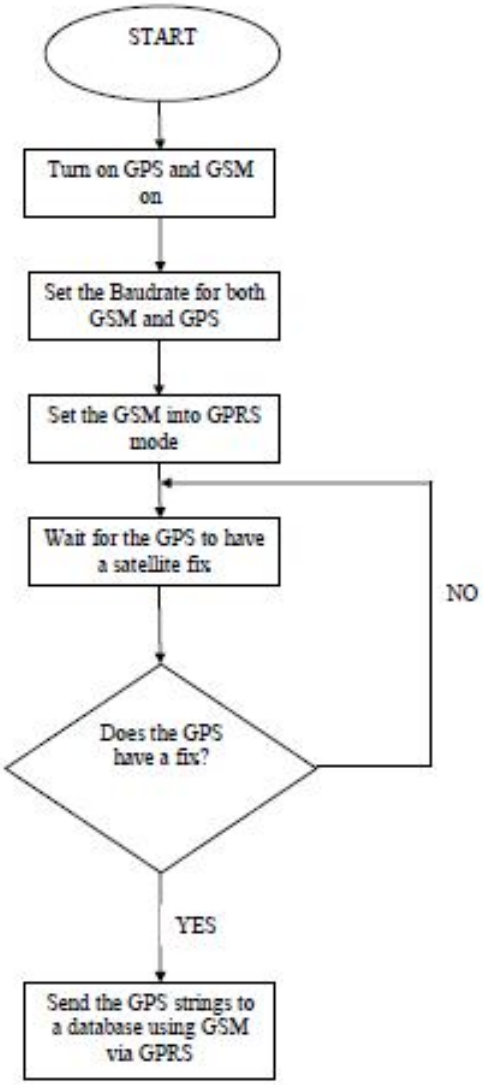

Fig.3 flowchart

The required power supply is given to the GSM and GPS and the maximum baud rate is set for both the GSM and GPS. The GSM will be provided with an inbuilt GPRS facility so the GSM is turned into the GPRS mode. The GPS device would provide the current location of the bus and sends the required information to the GSM, with the help of data from the GPS the text message is sent to the users mobile.

IV. WORKING

SBMS uses a variety of technologies to track the locations of buses in real time and uses this information to generate predictions of bus arrivals at stops along the route. It offers a convenient mobile information service that ensures passengers to organize multiple personal daily planning efficiently. The Fig 5 work flow shown below gives an idea of SBMS easy accessibility through hardware and networking software components.

Fig.5 overall workflow

The SBMS system comprises of all the components which uses Global Positioning System to detect the exact location of the vehicle of the organization.The Fig.4 shows the interfacing of arduino with GPS. The GPS would track the current geographical area of the bus and output will be fed into arduino micro controller, the output will be processed by the arduino and the arduino will send the signal to GPRS where the GPRS will process the signal and uploads the latitude and longitude to the google maps API.

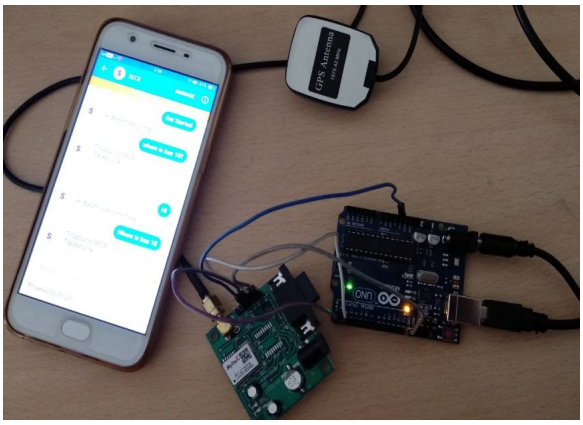

Fig.4 Arduino with GPS

The google maps API will be accessed by a tracker link created by the GPRS module.

The Chatbot will be attached to a facebook page which can be chatted with the followers of the page in facebook. Currently we are using this particular social media for the communication process with the users. The Chatbot will greet the users whenever they start their chat after a while. The Chat will be maintained in your private messenger chat.

The chat history can also be maintained. In the chat the bus can be identified by means of using the access buttons or else by asking questions like where is the bus XX? or Bus XX? or Where is XX?(where XX is the particular bus number). Different queries can be added to this system in which it makes the user to communicate easily with the machine. The answer can be given in the form of either button or direct link sent to the user via chat.

The user has to click on the button or an URL link and this button or link will redirect to the google maps webpage in web or else the maps app in case of mobile. The chat history can directly be maintained by the facebook database and it can be deleted by the user if he/she needs it to be deleted.

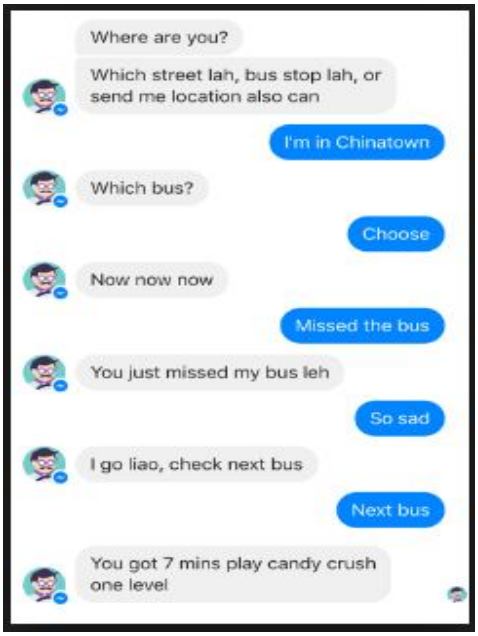

Fig.6 chatbot

The Fig.6 shows the interaction of user with the virtual machine system. The chatbot system would respond for the queries given by the user. The Chatbot will send message to the user who are all following the page or else who are all invited to follow the page and it can be seen by all the people who are all following the page.

If the organization needs security about their bus information they can add privacy to the facebook page that the users can only be added up to the page by inviting them.

V. FUTURE SCOPE

The local server of Wi-Fi can be changed to internet server, so the data accessible everywhere if there is internet connection. The ultrasonic sensor can be implementing in this system to obtain the number of passengers in the bus besides help student to know the quantity people in that bus via smart

phone. A web based application which can be further developed using cloud.

VI. CONCLUSION

The proposed system is successfully designed, implemented and tested and the following conclusions are made. Our system reduces the waiting time of remote users for bus. The system tracks the bus at any location at any time. All the current information can be retrieve from the GPS then and there and it can be seen by the remote users via chatbot associated with the facebook page. User can freely get this facebook page for real time tracking of bus which provide interactive interface environment.

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