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Design of Bus Tracking and Fuel Monitoring System

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***Abstract*—The need for efficient public transportation system such as buses is rapidly increased due to the increasing in population, the passengers need to know the accurate arrival time of the particular bus to particular station and then plan their journey from their home .Fuel monitoring have been the major problem that most of bus companies looking to solve. This paper developed a bus tracking and monitoring the fuel and speed system to provide a facility for the management requirements by the administrator. The proposed system based on Arduino, GSM/GPS and map suit ASP.MVC which provide the actuated arrival time in addition to graphically showing the bus location on Google map. The design also enables the owner of the buses to monitor the bus instantaneously because the system administrator can easily maintained database information of buses and its fuel tank at any time of the service.**

Keywords— bus track; MVC; Arduino; GPS; GSM; Fuel.

I. INTRODUCTION

The bus tracking system is a cost effective and efficient system, at the bus station people have to wait for long time without even knowing when the bus will arrive, the passengers, can't find the time of arrival of particular bus at the particular destination even at their homes and plan their journey accordingly. The proposed system present the bus arrival time prediction and fuel monitoring system that provide the accurate arrival time and bus view to the passengers ,and provide bus monitoring, schedule management and fuel monitoring to the bus company owner . Fuel level detection circuit calculates the fuel level from the fuel gauge which is present in all the vehicles the current position of the vehicle was acquired by Global Position System (GPS) receiver. The Arduino collect the data from fuel sensor, GPS and speed sensor send it to the server at the base station using GSM.

The data at server side are stored in a database tables witch designed to and can be retrieved as request for position browsing on map. A web site is developed using ASP.MVC web edition, Visual a Studio2013 with embedded Google Map to retrieve and display on track details. A desktop GUI is designed using ASP.MVC desktop edition to enable the owner to view the fuel level and the current in location of the buses in the map.

II. RELATED WORK

Around the world numerous vehicle tracking systems are being developed. These systems are included in many public and private vehicles in urban areas.

Shruti Kotadiaa [1]: presents a design depend on the using RFID stickers which installed on every bus, these stickers are installed for identification at bus terminals. Every bus stop is assigned by a unique ID, this unique ID is transmitted around some distance around it RF transmitters and when the RF receiver on the bus comes within the range of the transmitters, it will receive signal that is generated by bus stop and it will indicate the passengers the next stop.

Abid Khan [2]: proposed a design depend on the embedded system which is a single board system having GPS and GSM modems and ARM processor to track vehicle. This system has large capability, low operation cost, strong expansibility.

Madhu Kumar, K. Rajashekhar, et al [3]: proposed, Design of punctuality enhanced bus transportation system using GSM and zigbee. In this way service quality of operational efficiency is improved and passenger is also able to get the information about the respective bus

Manini Kumbhar1, Meghana Survase [4]: proposed real time web based bus tracking system given to remote user who want to know the real time bus information. Some technologies like GPS (Global Positioning System), Google maps and GPRS (General Packet Radio Service) are used for development purpose.

Ravi, Rohitaksha [5]. Propose a City Bus location and route navigation system using smart phones by using ICT (Information and Communication Technology).

All previous studies mentioned above talked about Vehicle tracking, but each of them have drawbacks, for example the RFID technology need another device at the bus stop in addition of the short rang The passengers cannot get the exact

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location of the bus, they will only be notified when the buses are nearing the user, and other system not track the location on the map. This paper based on the GPS and GSM to design simple, accurate, less used of complex circuit, power consumption and costless bus tracking and fuel monitoring system used Arduino and map suit Asp.MVC technologies.

III. METHODOLOGY

The architecture of the system in this paper is shown in fig.1. It provides the bus arrival time depending on the user source and destination. The overall outcomes functionality of the system comes from the interaction between the system components, which are a device on the bus, web application and desktop application. A device on the bus consist of Arduino, GPS, GSM, fuel sensor and speed sensor. The GPS receive the coordinate information from satellites and send it the Arduino, the fuel and speed sensors used to measure the speed and fuel level and send it to the Arduino, which collect all this data and send it to the server through the GSM.

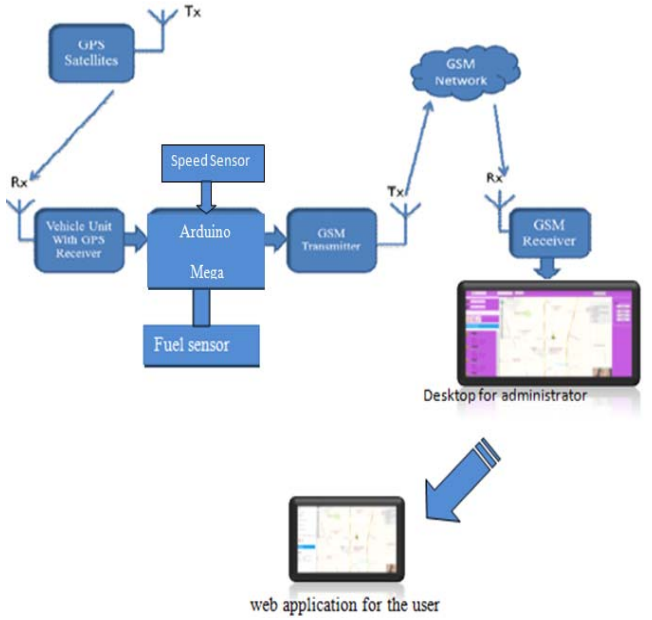

Fig.1. Architecture of proposed system

The device in the bus send a frame to the pc in the central station (server) .that frame consist of speed, location of the bus and its fuel level. The pc stores this information in the database in order to view it in the desktop application or web application.

There are GSM module at the server side used to receive the information from the buses and store it in the database. All information about the buses, drivers, stations and routes are also stored in the database and the owner able to delete, update and enter new information

Once the information is uploaded in the server the commuter can access the information via the web site using internet .The ASP.MVC and visual studio 2013 with embedded of Gogol map are used to design the web site that provide view of buses to the user and he/she can select the station where he stopping and the rout want to go. After that all buses that belongs to the require rout and the time that will take to reach the user station will display. Figure.2 and figure.3 illustrate the flow chart of the system.

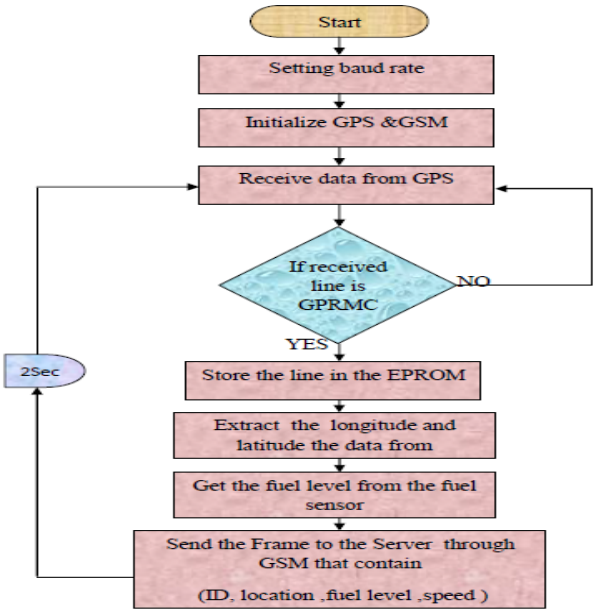

Fig.2. Sending Massage at the Bus Unit

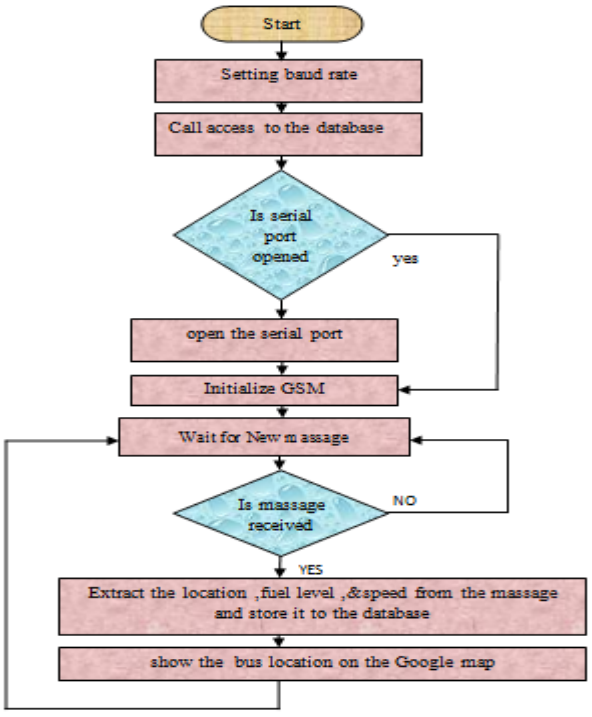

Fig.3. Mapping the Bus Location on the Google Map

The components and programs that used are:

A. GPS TECHNOLOGY

The global positioning system (GPS) is a satellite-based navigation system consists of a network of 24 satellites located into orbit as shown at figure 2.3. The system provides essential information to military, civil and commercial users around the world and which is freely accessible to anyone with a GPS receiver. GPS works in any weather circumstances at anywhere in the world. Normally no subscription fees or system charges to utilize GPS. A GPS receiver must be locked on to the signal of at least three satellites to estimate 2D position (latitude and longitude) and track movement. With four or more satellites in sight, the receiver can determine the user's 3D position (latitude, longitude and altitude). Once the vehicle position has been determined, the GPS unit can determine other information like, speed, distance to destination, time and other. GPS receiver provides data in NMEA 0183format with a 1Hz update rate. Generally message received by GPS is in National Marine Electronics Association (NMEA) message format and NMEA protocol which is most commonly used is NMEA0183 protocol. GPS sentences beginning with the following specifications:

$GPGGA, $GPGSA, $GPGSV, $GPRMC, and $GPVTG And sentences also begins with $GPMSS, $GPZDA.

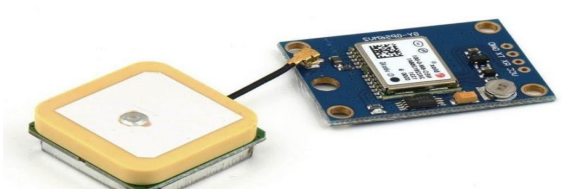

Fig.4. GPS Module

B. GSM module

The GSM modem is a specialized type of modem which accepts a SIM card operates on a subscriber's mobile number over a network, just like a cellular phone. It is a cell phone without display.

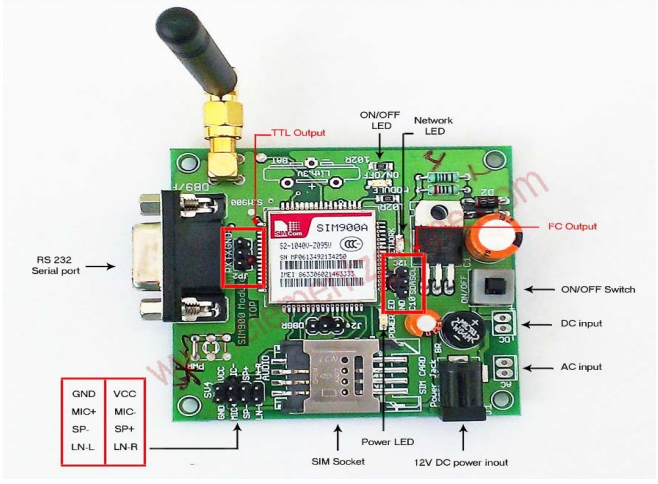

Fig.5. GSM module

C. Arduino mega 2560

The Arduino mega 2560 as shown in Figure3.6is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 14 can be used as pwm outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, and a reset button. 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 [6].

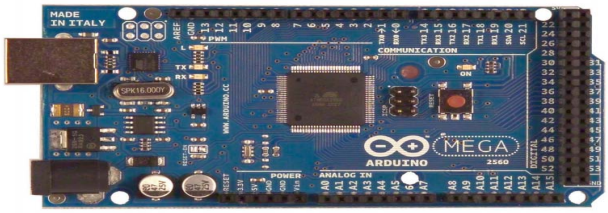

Fig.6. Arduino Mega 2560 [6]

D. ASP .NET MVC

It is an alternative to ASP .NET Web Forms it is short of Model View Controller. The Models (Business/domain logic) Model objects, retrieve and store model state in a persistent storage (database). The Views display application's UI that created from the model data. The Controllers handles user input and interaction, work with model and select a view for rendering UI.

IV. RESULTS AND DISCUSSIONS

First all the devices in the buses send a frame to the central station every 5 second through GPRS network using the GSM module. In the central station when the designed program is executed, main Form in the desktop application is displayed to perform the following:

- Setting the baud rate and the com of the GSM that connect with the central computer to open the connection with the bus
- When the connection establish the GSM receive the information from the buses and send it to the desktop application to store it in the database .this process occur in background.
- In figure_6 in the Setting section in the right side, if you press any button that Labels with a Buses, Drivers, Stations or Routs, the sub screen will appear as shown in the figures from 8 to 11, throw it the administrator can add or remove a buses, station, rout or driver information from the database.

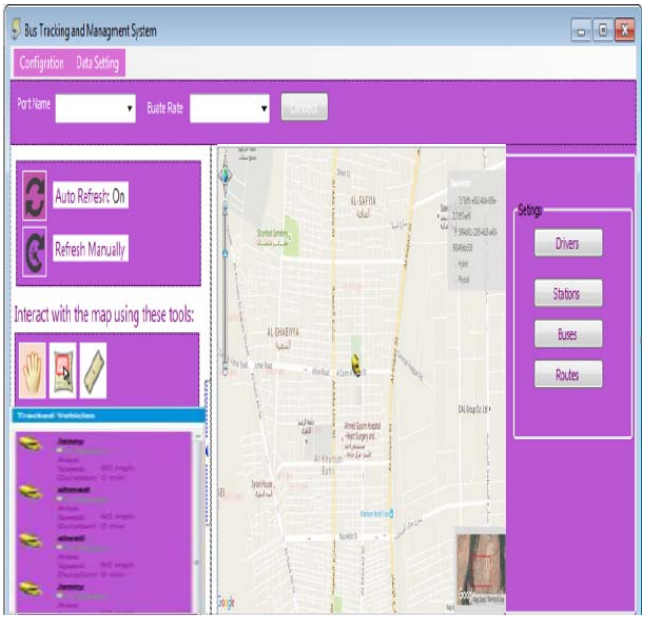

Fig.7. Desktop Application.

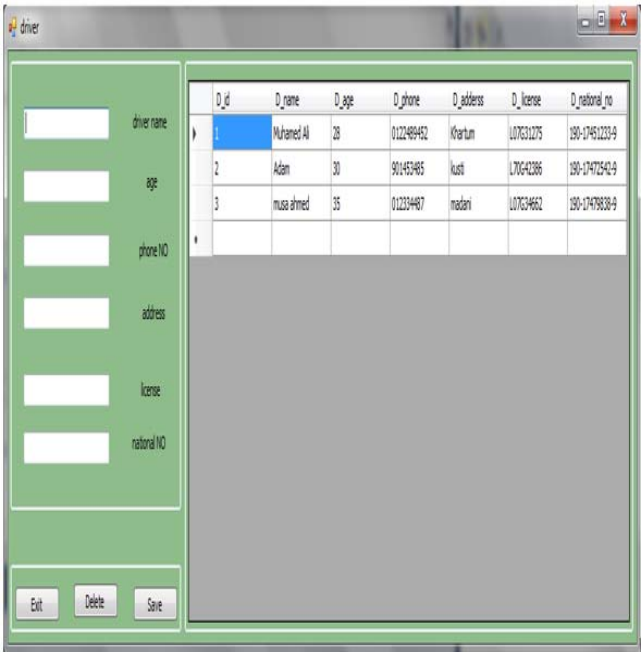

Fig.8. Update Driver Information

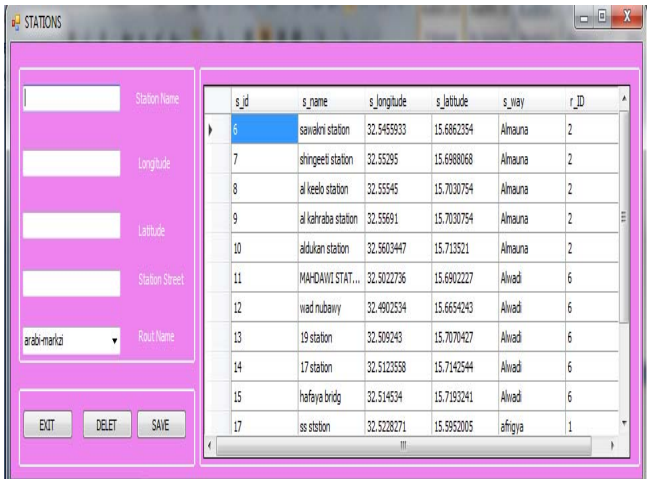

Fig.9. Update Station Information.

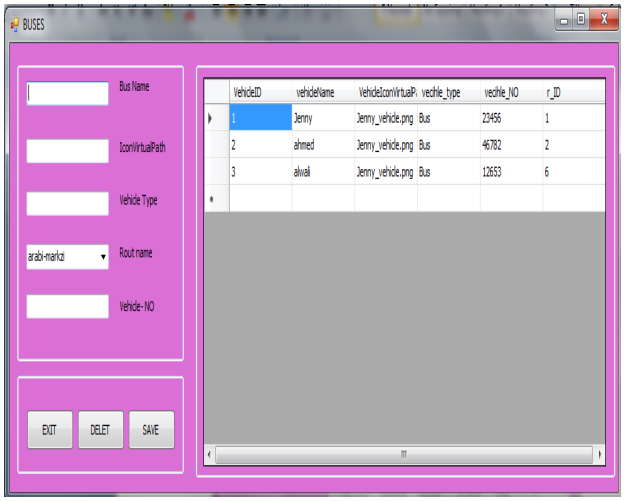

Fig.10.Update bus Information.

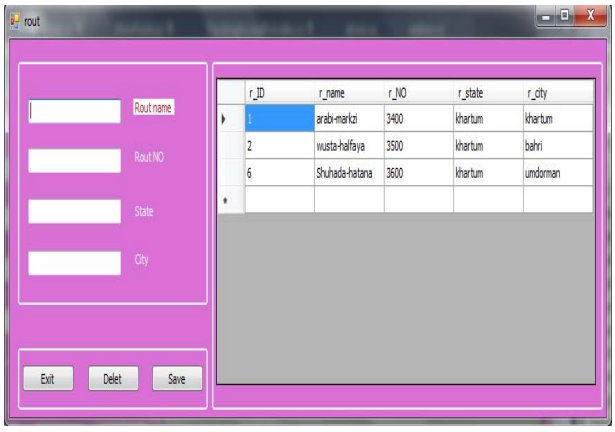

Fig.11.Update routes Information

When the user enters the web site a screen will appears as shown in fig.12.

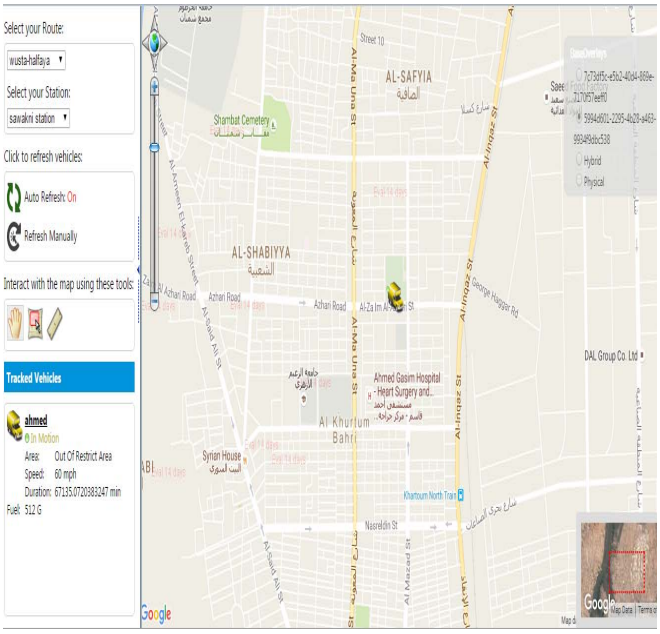

Fig.12. The Web Site

The user must the select station and the rout of the bus that want to go and all the buses that belong the rout witch selected will appear in the map in the middle of the screen and time that need to reach the station

V. CONCLUSION

This paper offers a smart design of tracking and monitoring the busses which helps the bus companies to provide high quality of service. This design can provide the location of the busses of the service with an error less than 10m in the case of slow speed and clear environment and the system give the accurate arrival time of the bus and provide the location of the bus in Google map for both user and administrator**.** This system reduces the waiting time of remote users for bus and provides bus tracking at any location, management and fuel monitoring.

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