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Real Time Vehicle Monitoring and Tracking System Using Raspberry Pi and Web Page

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Abstract: In this paper a prototype model of real time vehicle tracking and monitoring using raspberry pi is designed and implemented. A vehicle tracking system combines the use of automatic vehicle location in individual vehicles with software that collects these fleet data for a comprehensive picture of vehicle locations. The real time vehicle tracking and monitoring system tracks the vehicle and displays the current location of the vehicle both in Raspberry Pi and in the remote server using Google maps. It has the ability to communicate over the remote areas where user needs the current location of vehicle. It can provide tele-monitoring system for inter-cities transportation vehicles such as taxis and buses. This system is integrated with GPS and GSM to provide features like Location information and Real time tracking using SMS and also we can monitor the live streaming using camera this system can also be controlled using web page.

Keywords: GSM, GSP, Tracking, Raspberry Pi, Camera.

I. INTRODUCTION

Everyone knows the importance of vehicles in present transport system but we are facing lot of insecure in keep our vehicles safe. Every owner of the vehicle wants to know where their vehicles are running at each point. With the advancement in the technology we have solution for these insecure problems with the help this project. This avoids accessing of vehicles other than users and gives the vehicles present location system to the concerned person The system that functions as a tracking and a security system have been designed that uses two main underlying concepts. These are GPS (Global Positioning System) and GSM (Global System for Mobile Communication). This system can deal with both pace and security. The VMSS (Vehicle Monitoring and Security System) is a GPS based vehicle tracking system that is used for security applications as well. The main application of this system is tracking the vehicle to which the GPS is connected, giving the information about its position whenever required and for the security of each person travelling by the vehicle. This is done with the help of the GPS satellite and the GPS module attached to the vehicle which needs to be tracked. The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day. The GPS antenna present in the GPS module receives the information from the GPS satellite and it reveals the position information. This information received from the GPS antenna is sent to the controlling station where it is decoded.

Thus, the complete data related to the vehicle is available at the controlling unit. This information is sent to the owner or to the concerned person using a GSM modem. This GSM modem has an antenna too. This project also can control by a android application by android application also we can track the vehicle and also by using the GSM network also the vehicle tracking is done and in this the for security application also include like sensor's are interfaced to the Raspberry Pi. When the sensors are activated then the GPS location as sent SMS to user. And also user can monitor the vehicle by the camera. Inthissystem,I'vetakenRaspberry Pi(BCMBCM2837) and to monitor the vehicle .In this system android application is their also available to monitor the vehicle and also for security of vehicle also concern in this project for that sensor are interfaced to the Raspberry Pi. Interfacing camera with Raspberry Pi using USB ports and communicate by an open CV library. OpenCV is an open source library for image and video analysis, originally introduced more than decade ago by Intel. Since then, a number of programmers have contributed to the most recent library developments. The latest major change took place in 2009 (OpenCV 2) which includes main changes to the C++ interface. Nowadays the library has >;2500 optimized algorithms. It is extensively used around the world, having >; 2.5M downloads and >;40K people in the user group. Regardless of whether one is a novice C++ programmer or a professional software developer, unaware of OpenCV, the main library content should be interesting for the graduate students and researchers in image processing and computer vision areas.

II. SYSTEM ARCHITECTURE

The system architecture of this proposed system is following in Fig.1.

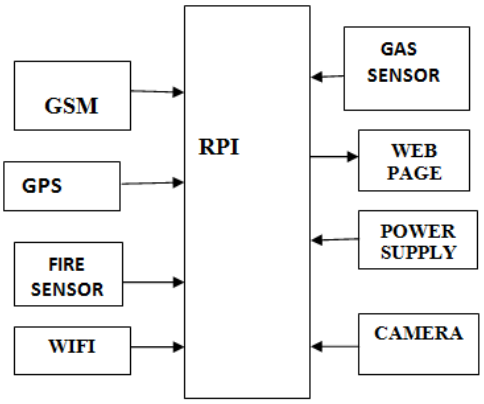

Fig. 1. Block Diagram.

Raspberry Pi END: Hardware implementation for this proposed system is shown in above with the blocks. Raspberry Pi is the processor and its relevant components. The GSM is interface with the Raspberry Pi and sensors are for security of vehicle and GPS module is interfaced to Raspberry Pi'sUSB serial port. Here Camera is interface for a live streaming. The GSM is mainly use to monitor and tracking the vehicle. WIFI is interface to Raspberry Pi's Port. The required Power supply is from 230v to 5v supply is used for input power supply and also proposed system getting from power supply block.

III. IMPLEMENTATION

A. Hardware

In hardware implementation, Raspberry Pi plays a key role in vehicle tracking system using web page. The Raspberry Pi is a small computer, same as the computers with which you're already familiar. It uses a many different kinds of processors, so can't install Microsoft Windows on it. But can install several versions of the Linux operating system that appear and feel very much like Windows. Raspberry Pi is also used to surf the internet, to send an email to write a letter using a word processor, but you can too do so much more. Simple to use but powerful, affordable and in addition difficult to break, Raspberry Pi is the perfect device for aspiring computer scientists. This small computer features amazing HD (high-definition) quality, video playback, also sports high quality audio and has the capability to play 3D games. The device use the ARM processor which does nearly all of the hard work in order to run the Raspberry Pi. The overview of Raspberry Pi has shown below Fig.2.

GPIO: One powerful feature of the Raspberry Pi is the row of GPIO (general purpose input/output) pins along the top edge of the board. These pins are physical interface between the pi and the oust side world. At the simplest level, you can think of them as switches that you can turn on or off (input) or that the pi can turn on or off (output).of the 40 pins, 26 are GPIO pins and other are power and ground pins. You can program the pins to interact in amazing ways with the real world. Inputs don't have to come from a physical switch.it could be input from a sensor or a signal from another computer or device, forexample. The output can also do anything, from turning on LED to sending a signal or data to another device. If the Raspberry Pi is on a network, you can control devices that are attached to it from anywhere and those devices can send data back. Connectivity and control of physical devices over the internet is a powerful and exciting thing and Raspberry Pi is ideal for this.

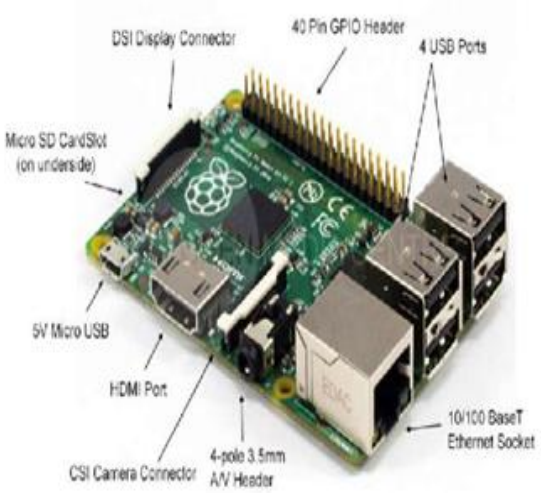

Fig.2. Block Diagram.

WIFI: USB wireless adapter that supports maximum range and speed. Despite the size, this tiny USB adapter supports higher data rate of up to 150Mbps when connecting with wireless 802.11n device which is 3 times faster than your normally 11g connection you can just plug it into computer's USB port and enjoy incredible high-speed wireless network access. This is for sure the trendiest piece of upgrade you can make to your wireless network in below fig.3.

Fig.3. WIFI Dongle.

Temperature Sensor: The temperature sensor willgive a variable output voltage with respect to the temperature variation. LM-35 is used as temperature sensor which is a precision integrated-circuit temperature sensor, Calibrated directly in ° Celsius (Centigrade), Linear + 10.0 mV/oC scale factor with accuracy O.soC (at +25°C) with rated for full -55° to +150°C range. Here we will set the minimum temperature value to 20° C and maximum temperature values to 30° C (for demo purpose, in real time the settings will vary with respect to plantation in the greenhouse). The Temperature Sensor which I have used in this project has shown below Fig.4:

Fig.4. Temperature Sensor.

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. Mobile services based on GSM technology were first launched in Finland in 1991. The GSM which I have used in this project has shown below Fig.5:

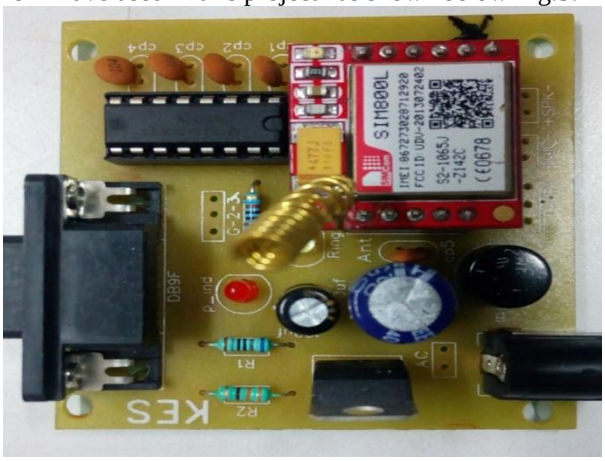

Fig.5.GSM Module.

The SIM800Lis a complete Dual-band GSM/GPRS module in a SMT type which is designed especially for Chinese market, allowing you to benefit from small dimensions and cost-effective solutions. Featuring an industry-standard interface, the SIM800L delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3 mm, SIM900A can fit almost all the space requirements in your applications, especially for slim and compact demand of design.

GPS Technology: The Global Positioning System (GPS) is a satellite based navigation system that sends and receives radio signals. A GPS receiver acquires these signals and provides the user with information. Using GPS technology, one can determine location, velocity and time, 24 hours a day, in any weather conditions anywhere in the world for free. GPS was formally known as the NAVSTAR (Navigation Satellite Timing and Ranging). Global Positioning System was originally developed for military. Because of its popular navigation capabilities and because GPS technology can be accessed using small, inexpensive equipment, the government made the system available for civilian use. The USA owns GPS technology and the Department of Defense maintains it. This type of GPS is used in our project as shown in Fig.6.

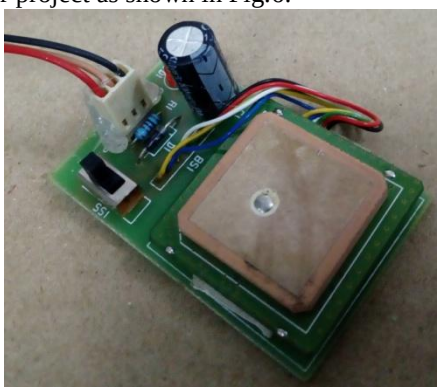

Fig.6. GPS.

Gas Sensor: The Gas sensor will give a variable output voltage with respect to the temperature variation. There is better sensitivity for natural gas and coal gas. The Gas Sensor which I have used in this project has shown below Fig.7:

Fig.7. Gas Sensor.

Camera:

Fig.8. USB Camera.

The USB camera Module is interfaced to the Raspberry Pi's USB port as shown in Fig.8. The camera is mainly used to capture the changes in the vehicle live video streaming is provided to monitoring station by using this camera. The required power supply to operate USB camera will get it from Raspberry Pi only.

B. Software

Here, to program Raspberry Python was used. Final Schematic Diagram of this Project has shown below Fig.9:

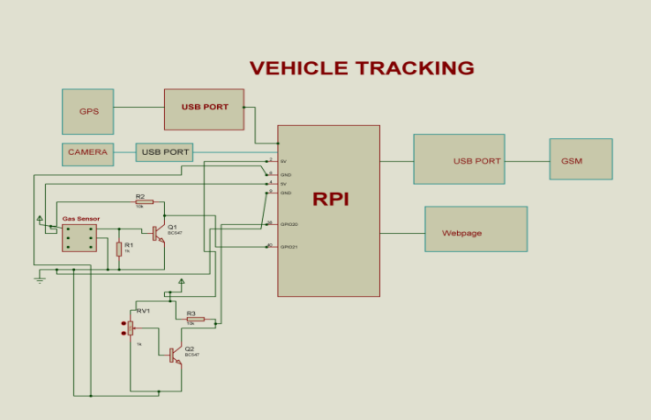

Fig.9. Schematic.

IV. ALGORITHM & FLOWCHART

Algorithm:

Step – 1: Initialize Raspberry Pi, GSM andGPS.

Step – 2: If temperature sensor is detected by fire then the GSM will send a vehicle met a fire accident locations to user.

Step – 3: if smoke sensor is detected GSM will send a location to user.

Step – 4: user can live streaming on a web server using camera.

Step – 5: System operates until it goes power off.

Flowchart: The flowchart of this paper is shown below Fig.10.

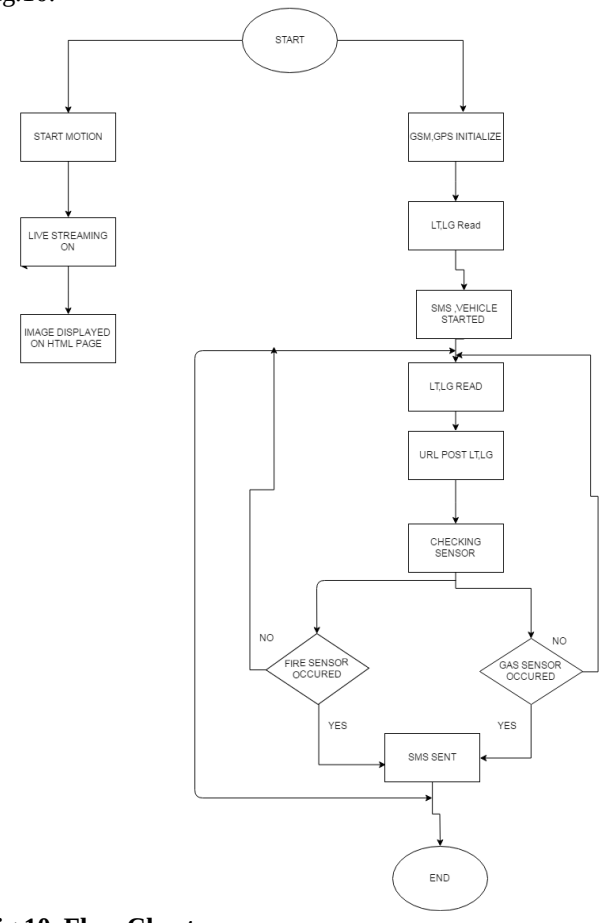

Fig.10. Flow Chart.

V. RESULTS

Results of this paper is as shown in Figs.11 to 17.

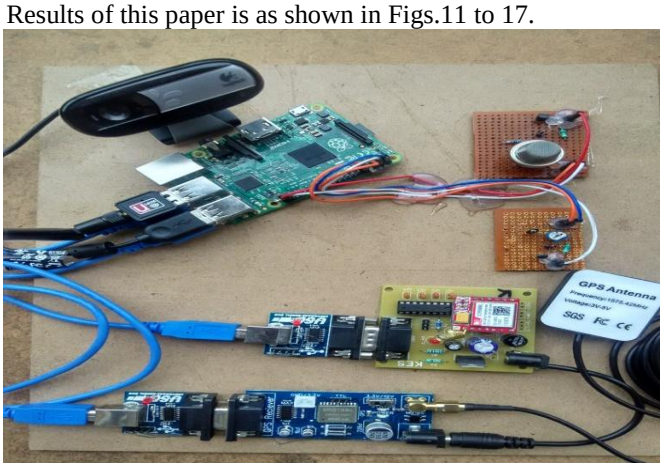

Fig.11.Final Prototype.

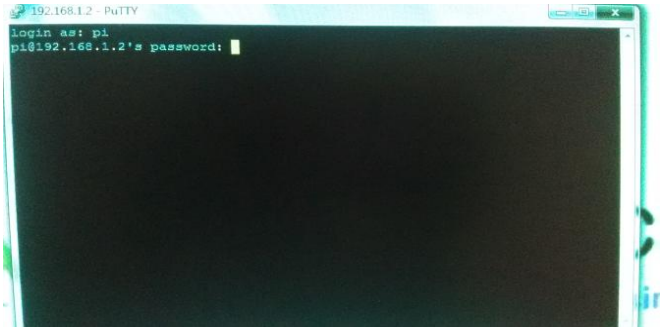

Fig. 12. Login into Raspberry Pi.

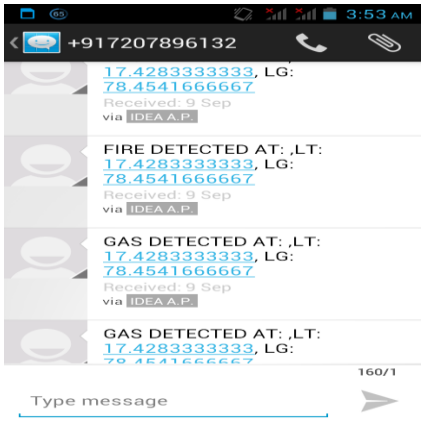

Fig .13. Fire detection notification.

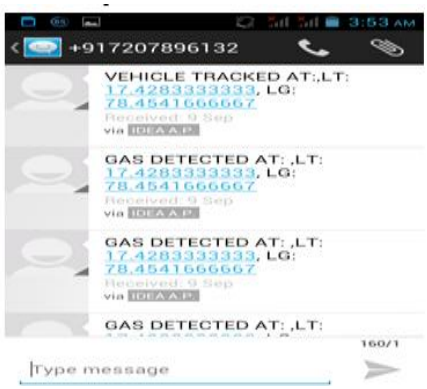

Fig .14. Gas detection notification.

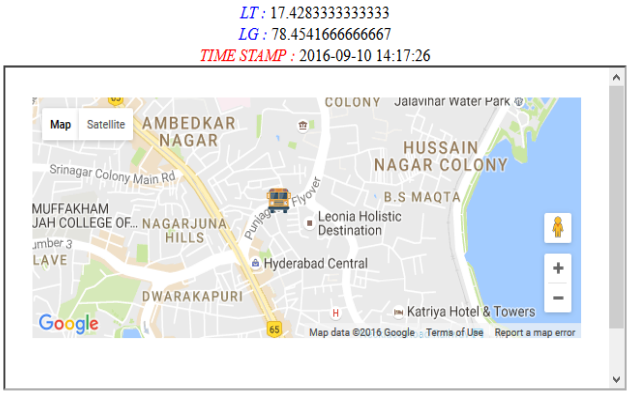

Fig. 15. Vehicle tracking on Google maps.

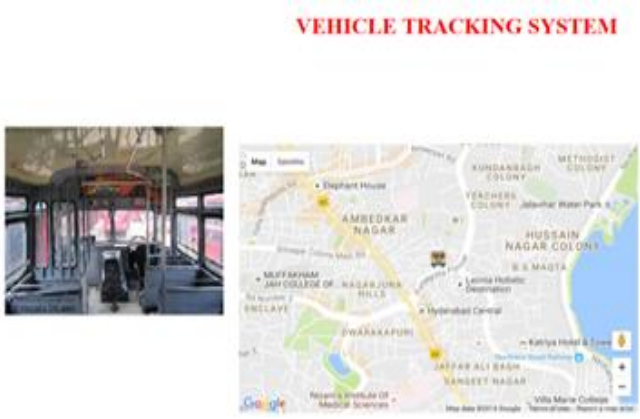

Fig. 16. Live Streaming.

LATITUDE	LONGITUDE	TIME STAMP
17.4283333333333	78.4544444444444	2016-09-08 14:32:54
17.4283333333333	78.4544444444444	2016-09-08 14:33:02
17.4283333333333	78.4544444444444	2016-09-08 14:33:10
17.4283333333333	78.4544444444444	2016-09-08 14:33:16
17.4283333333333	78.4544444444444	2016-09-08 14:33:23
17.4283333333333	78.4544444444444	2016-09-08 14:39:26
17.4283333333333	78.4544444444444	2016-09-08 14:39:33
17.4283333333333	78.4544444444444	2016-09-08 14:39:38

Fig. 17. Data base on Webserver.

VI. CONCLUSION

The Vehicular System provides information of a vehicle like position through a GPS module and identity of a vehicle to a monitoring station and to a mobile phone according to a definite event stored in a program or a query from a monitoring station. And sends this information in real time to a hospital/police station. The monitoring station display these information on web pagefor tracking, which may be installed in cargo trucks, cars, motorcycle, and boat. The system can be used in many applications.

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