A REAL-TIME GPS AMBULANCE/VEHICLE TRACKING SYSTEM DISPLAYED ON A GOOGLE-MAP-BASED WEBSITE

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ABSTRACT

This paper proposes a real-time ambulance/vehicle tracking system using a global positioning system (GPS) technology module to receive the location of the vehicle, to forward into microcontroller and to connect internet by a general packet radio service (GPRS) technology for displaying a real time on the website map developed by Google Map which allows inspection of vehicles at all times. There are 3 parts of this project. The first part is a program developed in C language for controlling the hardware. Employing PHP and AJAX language will be developed for the Google Map API to help a map construction on the website. The second part is the hardware, there are the GPS and GPRS modules, the GPS module will locate the vehicles via the satellite, and the GPRS module will assemble all data and send it to the website by the microcontroller. The final part is the interface using RS232 for connecting between the GPS and GPRS modules. With the Google Map on a real-time website, vehicles can be monitored and located very effectively. However, the small error is at approximately 5 meters in the wrong location due to the limitation of hardware and the ratio of map reference.

1. INTRODUCTION

When seriously ill patients are transported by ambulance, we suggest that a new mobile communication system would improve the speed and accuracy of diagnosis and save lives by transmitting medical data from the ambulance to the emergency medical center via a high elevation angle satellite (quasi-zenith satellite). Nowadays, vehicles are essential to transport products or goods in many organizations or firms, but there are many problems of using the vehicles for their business such as the delay of the deliveries, driving out of paths, or even stealing oil and products. Therefore, GPS and GPRS are important technologies for monitoring such problems. However, it is still not easy to implement them for monitoring and tracking vehicles on the website using Google map. Recently, the GPS technology has been presented in many researches. For example, the paper [1] has presented a vehicle warning system be responsive to vehicle speed and position as determined by GPS. The paper [2] has proposed an object locator system for obtaining information about the location of an individual, animal or moveable object. The paper [3] has presented a vehicle navigation of train, collision avoidance and control system. The paper [4] has proposed an estimating GPS time at cellular terminals based on timing of information from base stations and satellites. However, no papers have demonstrated the GPS and GPRS technologies for a real-time vehicle tracking based on the Google map.

In this paper, a real-time ambulance/vehicle tracking system proposes the use of a global positioning system (GPS) technology module to receive the location of the vehicle, to forward into microcontroller and to connect internet by a general packet radio service (GPRS) technology for displaying a real time on the website map developed by Google Map which allows inspection of vehicles at all times. There are 3 parts of this project. The first part is a program developed in C language for controlling the hardware. Employing PHP and AJAX language will be developed for the Google Map API to help a map construction on the website. The second part is the hardware, there are the GPS and GPRS modules, the GPS module will locate the vehicles via the satellite, and the GPRS module will assemble all data and send it to the website by the microcontroller. The final part is the interface using RS232 for connecting between the GPS and GPRS modules. With the Google Map on a real-time website, vehicles can be monitored and located very effectively. This includes paths and/or vehicles directions. However, the small error is at approximately 5 meters in the wrong location due to the limitation of hardware and the ratio of map reference.

2. TECHNOLOGY BACKGROUND

2.1 GPS TECHNOLOGY

A GPS tracking unit (Figure 1) is a device that uses the Global Positioning System to determine the precise location of a vehicle, person, or other asset to which it is attached and to record the position of the asset at regular intervals. The recorded location data can be stored within the tracking unit, or it may be transmitted to a central location data base, or internet-connected computer, using a cellular (GPRS), radio, or satellite modem embedded in the unit. This allows the asset's location to be displayed
against a map backdrop either in real-time or when analyzing the track later, using customized software.

**Figure 1** GR-82 GPS Module

### 2.2 GPRS Technology

GPRS technology (Figure 2) allows mobile phone to be used for sending and receiving data over an Internet protocol based network and the mobile system can keep communication with the monitoring center when the vehicle is at the speed over 100 km/h. So we can do real-time radiation survey in large area. The system is useful to the works such as routine patrols, nuclear terrorism, radioactive pollution accident and nuclear accident.

![Figure 2 GSM/GPRS Module: ET-GSM SIM300CZ](image)

**Figure 2** GSM/GPRS Module: ET-GSM SIM300CZ

### 2.3 Google Map

GPRS technology (Figure 3) allows mobile phone to be used for sending and receiving data over an Internet protocol based network and the mobile system can keep communication with the monitoring center when the vehicle is at the speed over 100 km/h. So we can do real-time radiation survey in large area. The system is useful to the works such as routine patrols, nuclear terrorism, radioactive pollution accident and nuclear accident.

**Figure 3** Google Map

### 3. PROPOSED AND PROTOTYPE SYSTEM

We have implemented a prototype based on the designed in Section III. Figure 1 shows the prototype of our GPS Tracking Module. The size of the prototype is about 2.5” wide by 4.5” long and by 2” thick. Figure 4 shows the hardware at the ambulance that has a GPS and GPRS Module. Figure 5 shows a proposed system of the real-time GPS ambulance/vehicle tracking system displayed on a Google-Map-based website consisting of five processes as follows. For the first process, the GPS module will connect the satellites and then it will be received the position (latitude and longitude) from the satellites. In the second process, the GPRS module will connect the cellular antennas and then it will send the position to the database servers shown in the third process. For the fourth process, the proposed website based on Google Map will display the vehicle tracking using the data from the database servers containing the GPS position. In the last process, the people can access the website for monitoring the vehicle objects.

![Figure 4 The hardware at the Ambulance.](image)
4. EXPERIMENTAL RESULTS

For the overall results, the small error for tracking vehicles is below 15 meters in the wrong location due to the limitation of hardware and the ratio of map reference. We can see that the tracks of the mobile system can be always displayed on the road of the electric map.

Figure 6 An example of the real-time GPS vehicle tracking based on Google Map (from 19:46 to 19:58).

GPS can provide not only precise latitude and longitude data, but also can provide very accurate time data by the satellites. The time of the computers and PDAs can be corrected by GPS before a start of the mobile radiation survey. Figure 6 and 7 show an example of the real-time GPS vehicle tracking based on Google Map. As shown in Figure 6, there are two positions which are two different times from 19:46 to 19:58. As shown in Figure 7, there are two positions which are two different an oil level from 3 down to 2.

Figure 7 An example of the real-time GPS vehicle tracking based on Google Map (OIL Level 3 to 2).

5. CONCLUSION

The real-time vehicle tracking system has been presented through the use of the global positioning system (GPS) technology module to receive the location of the vehicle, to forward into microcontroller and to connect internet by a general packet radio service (GPRS) technology for displaying a real time on the website map developed by Google Map which allows inspection of vehicles at all times. The Goo-tracking system has shown the feasibility of using it for fleet management. It can also be used for lost vehicle tracking when working with the ambulance alarm system. In the future, we will plan to integrate other sensors. The sensors report vehicle status information for intelligent tracking management. However, it includes paths and/or vehicles directions and the small error is at approximately 5 meters in the wrong location due to the limitation of hardware and the ratio of map reference.

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7. REFERENCES

Figure 5 The real-time GPS ambulance/vehicle tracking System.