

Problem Statement

The rate of school bus and van accidents in Kenya have been alarming to parent, relatives and Kenyans at the thought of young children losing their lives (Obuhuma, Ondiek & Ombui, 2013).

Using school busses involves handing over children to persons who parents trust will deliver them to school. With the high number of pupils crisscrossing the City of Nairobi to attend school in school busses, there is need to track them at all times. Tracking the vehicles and as a result the children will provide peace of mind for parents and school administrators.

There is need for an integrated system for schools administrators, school buses and parents to automatically track the movement of pupils in real-time. This system would help reassure parents and school administration of the safety of the pupils.

Research Questions

- i. What systems are being used in schools around the world to track school buses?
- ii. What solutions are used in Nairobi County to track school children?
- iii. What technology solution can be used to notify parents and schools on the location of pupils?
- iv. Is the developed solution efficient in tracking school children while on transit?

Scope of Work

This thesis is aimed at linking junior primary school pupils with their parents during transit to and from school. It is limited only to notification of parents whenever the pupil boards and alights a school bus and tracking the bus via GPS through a mobile phone in the vehicle.

The study will be constrained to Nairobi County schools and parents and the devices to be used in this research are Android based smartphones with Internet, GPS and NFC capability.

2.3. Need for Tracking Children

Millions of children need to be moved from home to school and vice versa every day. For parents, obtaining safe transport for their children is a critical issue. Many children find themselves locked in a school bus in the bus parking lot after falling asleep on their way to school, miss the bus, step into the wrong bus, or leave at the wrong station with no means of track them (Shaaban et al., 2013). A research undertaken by the Scottish Executive Central Research Unit with the purpose of increasing the proportion of non-car travel to school reveals that travelling by bus or coach appears to be by far the safest mode (Shaaban et al., 2013).

2.4 Child Tracking Solutions

Several child tracking solutions have been designed around the world to assist parents monitor their children. A solutions designed for Malaysia by Al-Mazloun, Omer & Abdullah (2013) describes a GPS and SMS based child tracking system using a smart phone. They proposed an android based solution to aid the parents track their children in real time. It works by a parent sending a request location SMS to the child's smart phone. The child's devise will then reply with he GPS position to the parent's device. This solution takes advantage of the many children using smartphones these days and is aimed at locating missing or lost children. Tekawade et al. (2014) have designed a mobile tracking app for locating friends using GPS. The application is implemented as a client server system to help users locate their friends and receive alerts when their friends are nearby. The application works in open space areas only since it relies on GPS by calculating the longitude and latitude values of the mobile.

2.6 Benefits of Tracking to Parents and Schools

An online article, Should Parents Use GPS Tracking on their Kids? (n.d.), lists some benefits of tracking children using GPS. With the increased availability and technology of GPS tracking now so easily accessible, it can be used to keep track of children at all times. If a child is young enough to get lost or be abducted, using GPS is not an invasion of privacy. A GPS tracker can be placed inconspicuously in a child's backpack, jacket or pocket, so the parent can always know that the child is safe in school, has made it home safely from school, or is where they're supposed to be. Another great benefit of GPS tracking for kids is to help care for children that have mental disabilities or behavioral problems such as Attention Deficit Disorder (ADD). A child that has mental disabilities or behavioral issues may be more inclined to wander away from their guardian when they become distracted. Whether a child has ADD or Autism, a GPS tracking monitor can give you much needed peace of mind when he or she is not directly in your care.

2.7 EXISTING SYSTEM

- Implementation of children tracking system on android mobile terminals is a system which is introduced to track the children using a child module that transmits the tracking information to a database and a mobile device.
- A Self Configurable New Generation Children Tracking System Based on MobileAd Hoc Networks Consisting of Android Mobile Terminals is introduced to report a tracking system that utilizes Android terminals that communicate among themselves using Bluetooth technology to form clusters.

PROPOSED SYSTEM

A. Description

A SMS based solution to aid parents to track their children location in real time is proposed. The system will be designed to monitor children ridership in a safe and non-intrusive way. It will use a combination of RFID, GPS (Global Positioning System), and GSM technologies. Each student is issued one or more unique RFID card(s) to carry. The card will be embedded in the school bag for each student. As the student's tag is detected by the reader installed in the school bus upon entering or leaving the bus, the time, date and location is logged and transmitted to a secure database. The system will enable

parents to receive instant SMS alerts when bus is within 10 minutes of the designated pick up and drop off points reducing the time the child spends on the street as shown in Figs.1 and 2. The system will also notify parents via SMS when the child boards and alights from the bus or enters/leaves the school. Parents will take the appropriate action because they have precise answers to boarding status and times. If a child is still inside the bus for a predefined time after the vehicle's engine is turned off, and doors are closed, an SMS message will be sent to parents.

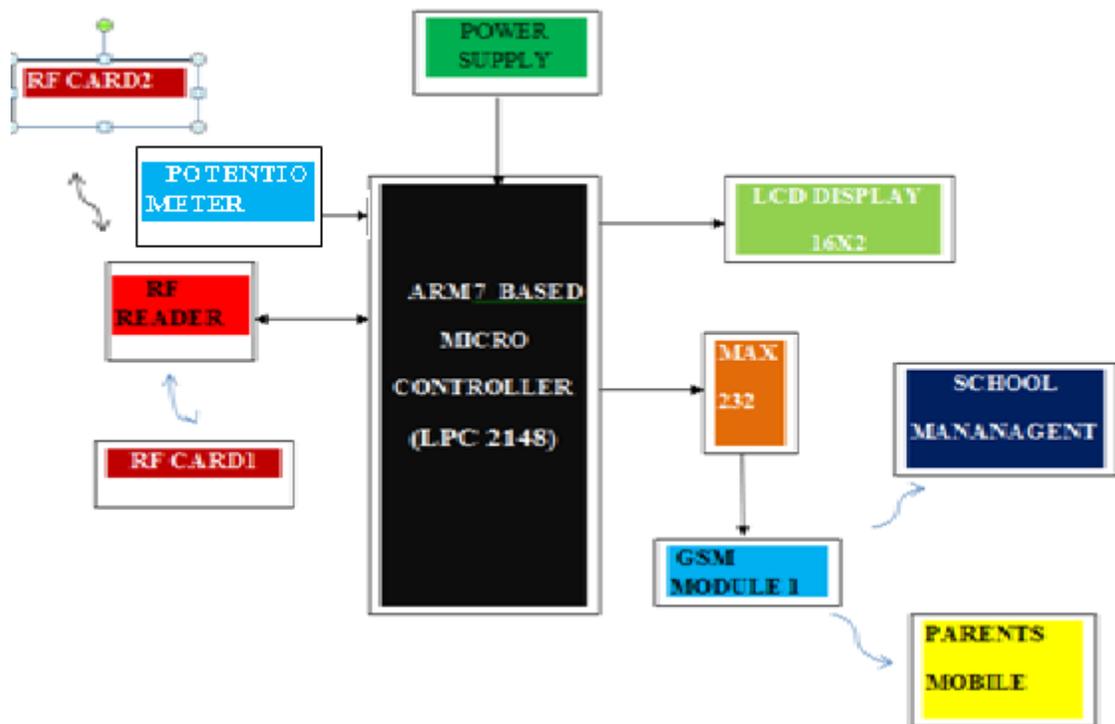


Fig. 1. Block diagram for Bus unit.

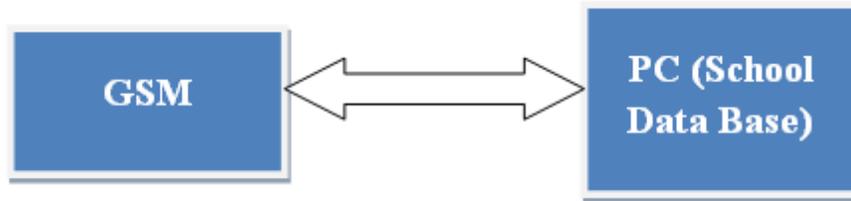


Fig.2. Block diagram for School unit.

1.3 TRACKING SYSTEM

GPS, GSM, Tracking System

1.3.1 INTRODUCTION

In this urban life transportation is very common. A lot of mishappenings occur on the road everyday .Therefore the need of security and monitoring is developed. To resolve such problems, a system is developed using GPS and GSM technologies and an application is introduced in this research work.

Various problems that we face:

1. In critical condition (when vehicle is stolen), one is confused what to do
2. If one has something expensive and he wants to check it regularly
3. To find the shortest path available

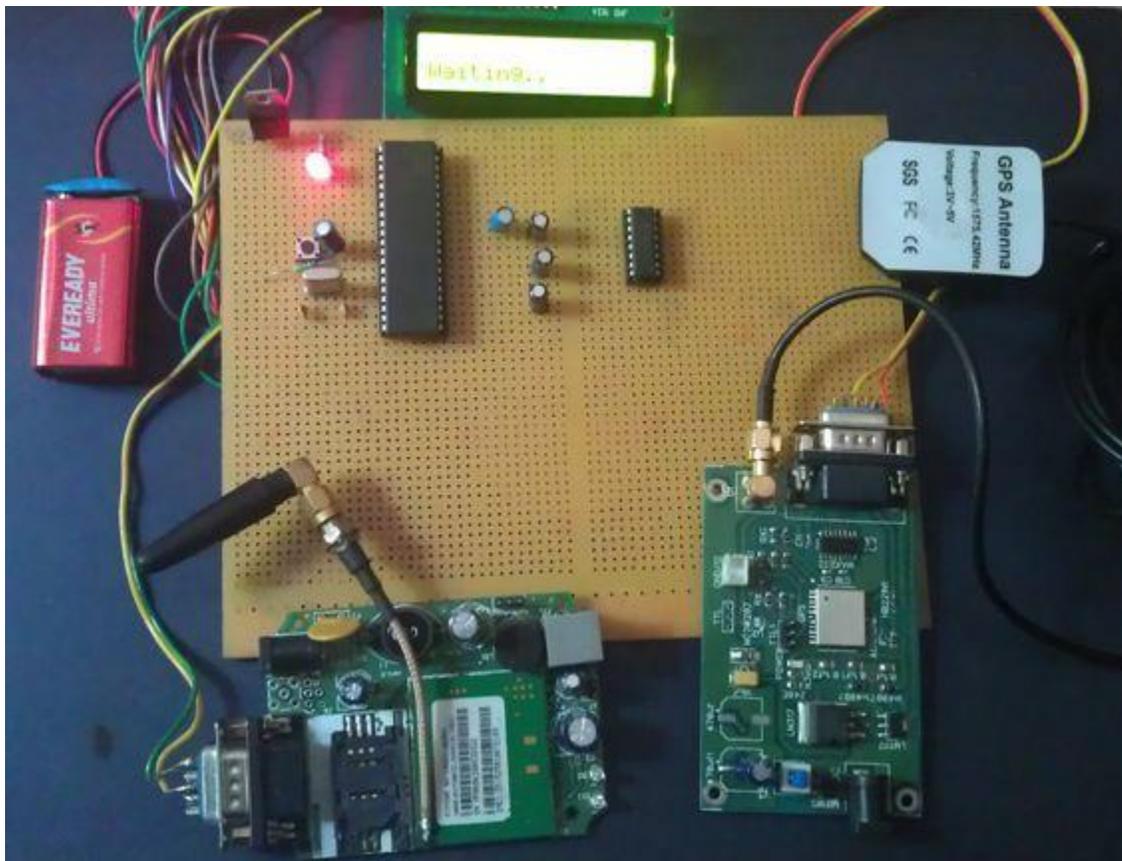
All these problems are overcome by the system.

This system has Global Positioning System (GPS) which will receive the coordinates from the satellites among other critical information. Tracking system is very important in modern world.

This can be useful in soldier monitoring, tracking of the theft vehicle and various other applications. The system is microcontroller based that consists of a global positioning system(GPS) and global system for mobile communication (GSM).

This project uses only one GPS Device and a two way communication process is achieved using a GSM modem. GSM modem, provided with a SIM card uses the same communication process as we are using in regular phone. International Journal of Computer Science, This system is not limited to find the location of the target but also calculates the distance travelled b/w two stations. This system is user friendly, easily installable, easily accessible and can be used for various other purposes. After installation system will locate target by the use of a Web application (HTML based application) in Google map. The system allows to track the target anytime and anywhere in any weather conditions.

1.6 HARDWARE DESIGN



In this we are using a 40 pin ATmega16 microcontroller. It has four input–output ports. ATmega16 microcontroller is the heart of the project that is used for interfacing. Two pins are VCC pins and other two pins are at ground. Pin 9 is reset pin. A crystal oscillator of 12 MHz is connected to the microcontroller. RS-232 protocol is used as serial communication between the microcontroller, GPS and GSM modem. A serial driver MAX232, 16 pin IC is used for converting RS-232 voltage levels into TTL voltage levels. There are four electrolytic capacitors which are used with MAX232. A 9V battery is used to power the circuit. A 7805 regulator is used to convert 9V into 5V. The microcontroller and MAX232 are powered by 5V. LED indicates the presence of power supply.

1.7 SOFTWARE PROGRAM

The software programming is done in 'C' language. Data (co-ordinates) received by GPS from the satellites is defined in the software. Decoding the NMEA (National Marine Electronics Association) protocol is the main purpose of developing this software. The mobile number of the user should be included in the software programming in order to receive the location values from the SIM card which we are using in GSM modem. The NMEA protocol consists of set of messages. These messages are ASCII character set. GPS receives data and present it in the form of ASCII comma – delimited message strings. '\$' sign is used at the starting of each message. The locations (latitude and longitude) have the format of ddmm.mmmm. i.e. .degrees minutes and decimal minutes. The software protocol consists of the GGA (global positioning system fixed data) and GLL (geographic position latitude/longitude). But in this system we are using CGA only. The flow chart of the system is given as:

No

Yes

1.8. WEB APPLICATION

The web application named as 'Tracking System' is shown in figures that represents the complete output of the system. In this system two applications are developed that are linked to each other. First one is used to get the initial position of the vehicle (starting point) and as system will receive the different co-ordinates (longitude and latitude) switching to the next one will be done to get the distance travelled b/w the two positions. The application will run on WAMP

server and will run only if the internet is in use. WAMP server homepage is shown in diagram. GSM, GPS on GPS on (get coordinates) GSM gets data and send GSM waits for the request User receives the data

1.8.1 Various features of web Application are:

- Both the applications are user friendly .i.e. new users can be easily comfortable.
- Since the applications are HTML based user can easily modify according to his requirements
- Gives the exact location of the target.
- The applications also alerts about the distance travelled by the target and also the routes that are possible to reach to the target.

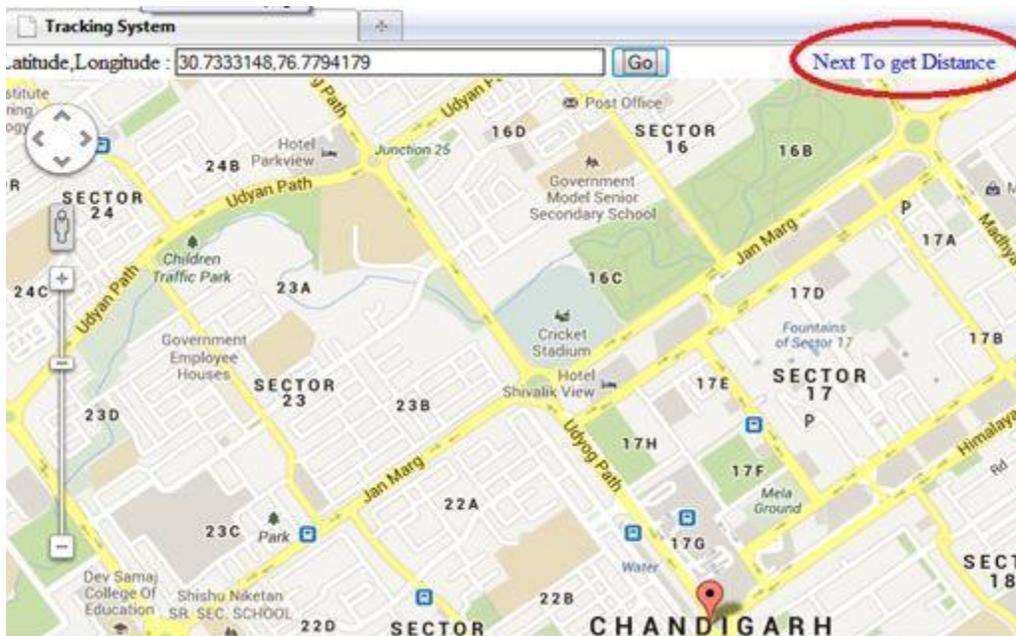


Figure 6. System Application 1

Figure 6 shows the first application where location will be found .As shown in figure by clicking on the ‘next’ button will open up next page, where the route and the distance travelled will be found. And by clicking on the ‘Back’ button will open up first one (page) as suggested in the fig. 7. Both the applications are HTML based. PHP is also used for some modifications.

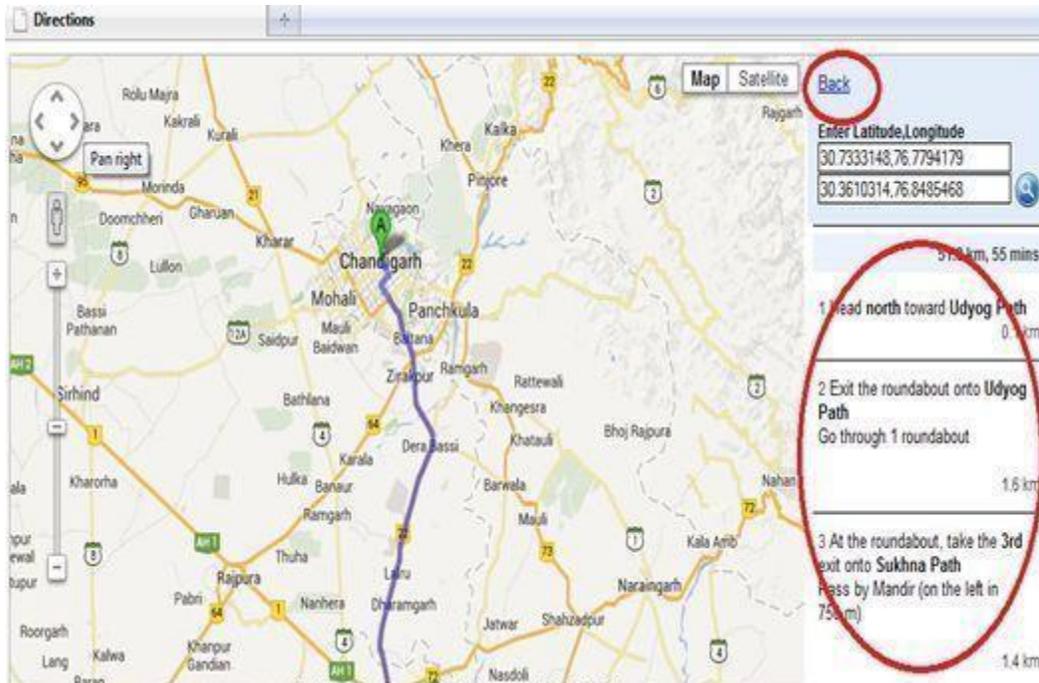


Figure 7. System Application 2

Introduction

As GPS devices become more accurate, efficient, and cost-effective, can it be entirely reliable in real applications? There are shortcomings found in the GPS data, for instance:

- Inaccuracy: Most modern low-cost GPS receivers have a stated accuracy of 5 meters in geographical positioning. This implies a precision in instantaneous speeds calculated from this data to be $\pm 18\text{km/h}$, if a 1 second sampling interval is used.
- Complexity: The inaccuracies outlined above mean that for any real useful purpose, complex rules must be imposed when analyzing the data in order to try to reflect the individual's mobility. Furthermore, the reliability evaluation is more crucial in transportation applications due to the inherent restriction from the road network.

Conclusion

The GPS tracking data identified the actual positions of the vehicles fairly successfully. The surroundings of the experiment had no obviously interfering attributes like high built-ups, forests,

magnetic fields, and so on. The partially poor identification of the bike's positions by trees and in the vicinity of magnetic fields shows however that the positional error of the GPS is highly vulnerable to the surroundings (see also Modsching et al., 2006). Fortunately, this problem can be rectified by using map-matching algorithms as proposed by Brakatsoulas et al. (2005), Taylor et al. (2006), and Quddus et al. (2007). We believe that the GPS tracking data on position may be useful for routing, mobility pattern recognition, and general navigation of travellers. However, the accuracy is insufficient in cases requiring high geographical precision such as parking, emergency rescue, and the like.

Reference

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4.2 Terminology

4.2.1 Latitude & Longitude

Both are the angles that are uniquely defined on the sphere. Together the angle comprises the coordinate scheme that can locate or identify the geographic position on the planet. Latitude is defined with respect to the equatorial reference, the value becomes positive as it moves towards north and it becomes negative towards south. Longitude is measured with reference to prime meridian and is positive towards east and negative towards west.

4.2.2 Routing

Routing means a compass sensor is used to calculate the angle between the current direction of mobile vehicle and magnetic north direction [1].

4.2.3 Tracking

Tracking allows the base station to continuously track the vehicle without any interference of the driver or the method of continuously collecting the co-ordinates of moving vehicle that is getting from GPS receiver.

4.2.4 Vehicle Disabling

Vehicle can be disabled just by sending the SMS from the GSM modem of owner to the GSM modem which is in car. The form which is generated in Visual Basic in the computer is connected to the GSM. If the message is sent to disable the vehicle then the vehicle can be disabled. This feature is not present with any of the vehicle security system.