GPS AND GSM BASED VEHICLE TRACKING SYSTEM

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Abstract: Initially the GPS continuously takes input data from the satellite and stores the latitude and longitude values in Arduino Uno. If we have to track the vehicle, we need to make a call to GSM device, by which it gets activated. Once GSM gets activated it takes the last received latitude and longitude positions values from the Arduino Uno and sends a message to the particular number or laptop which is previously called to the number. Once message has been sent to the device the GSM gets deactivated. From the latitude and longitude values we can get the location by using GOOGLE maps.

Index Terms **–** Arduino, GPS, Global Positioning System, Global Navigation Satellite System, GSM, Vehicle Tracking.

I. INTRODUCTION

The "Vehicle Tracking System using GPS and GSM Technology" project is designed and develop to accommodate the needs of today's vehicle fleet company to keep track on their fleets. It is a very useful and versatile device, and in fact it is able to be used by anybody with the need to keep track on their valuable goods and not just by the vehicle fleets company. The desired output from the system will be the data such as position, speed, and time obtained from the GPS receiver and will displayed on the computer screen. This chapter will be covering the general background of this project, its concept, objectives, scope and the problem statement.

The tracking system currently deployed in the country utilizes the GSM system to locate the Tracked object. The limitation of this system is that the GSM technology can only identify the Base Transceiver Station (BTS) and the sector antenna under whose coverage the tracked Object is located and this operation requires the services of the mobile operator whose Network is used to carry the tracking information for the information to be accessed. A communication program installed in Arduino from that device communicates with GSM modem to provide users real time Data related to a person's movement and location. To investigate the current uses and applications of GPS tracking through multiple Usability context analysis.

II. LITERATURE REVIEW

A vehicle tracking system consists of an electronic device installed on a vehicle so that it could be track by its owner or a third-party for its position. Most of today's vehicle tracking system uses Global Positioning System (GPS) to get an accurate reading of the vehicle position. Communication components such as cellular (GSM) and satellite transmitter will be combined to transmit the vehicle's position to remote user. Vehicle's information can be viewed by using a software on a computer. Vehicle tracking systems are commonly used by fleet operators for fleet management functions such as routing, dispatch, on-board information and security. Other applications include monitoring driving behavior, such as an employer of an employee, or a parent with a teen driver. Vehicle tracking systems are also popular in consumer vehicles as a theft prevention and retrieval device. Police can simply follow the signal emitted by the tracking system and locate the stolen vehicle.

When used as a security system, a Vehicle Tracking System may serve as either an addition to or replacement for a traditional Car alarm. The existence of vehicle tracking device then can be used to reduce the insurance cost, because the loss-risk of the vehicle drops significantly. Vehicle tracking is also useful in many other applications such as Asset Tracking scenarios where companies needing to track valuable assets for insurance or other monitoring purposes can now plot the real-time asset location on a map and closely monitor movement and operating status. Meanwhile, in field sales mobile where the situation of sales professionals can easily access real-time locations. For example, in unfamiliar areas, they can locate themselves as well as customers and prospects, get driving directions and add nearby last-minute appointments to itineraries. Benefits are including increased productivity, reduced driving time and increased time spent with customers and prospects. It is having been reported that, with this system, the users have been able to get many benefits by auditing employee hours to insure better utilization of vehicles. This system has also proof its ability to reduce mileage hence, reduce the fuel costs through monitoring private use of vehicles. Reducing the average speed of the vehicles also improve the fuel efficiency. Productivity also will be increased through better budgeting of time and resources.

III. PROBLEM STATEMENT

GPS vehicle tracking systems have proven to be effective in determining the precise location of a vehicle or asset. GPS tracking uses a system of satellites orbiting the earth to find an approximate placement of the receiver within a few meters of its actual location. Systems range from the passive, battery operated tracking key, to the highly sensitive, active or real time systems with various installation options. Both are designed to enhance fleet efficiency and profitability by monitoring driver location and speed. Passive GPS tracking means that the GPS receiver stores all location information to be accessed or downloaded at a later time. Passive systems are generally limited to vehicle tracking only and are useful to individuals and businesses which typically do not need to view information in real time. Real time GPS systems employ wireless networks (GSM) that accurately determine the exact location of a vehicle. The user instantly receives location data from the GPS receiver while the vehicle is still in motion. Real time systems are most widely used by companies who wish to monitor fleet vehicles and other assets.

IV. PROPOSED SYSTEM

The overall concept of this project is shown in below figure 1. The output of this system will be the data obtained from the GPS receiver. The data contains information such as speed, position and time. The data from the GPS receiver will be send using GSM module to the receiving end. On the receiving end, the GSM modem will receive the data and displayed it on the screen of the computer. The computer also can be used to send command to the GPS receiver through the GSM module

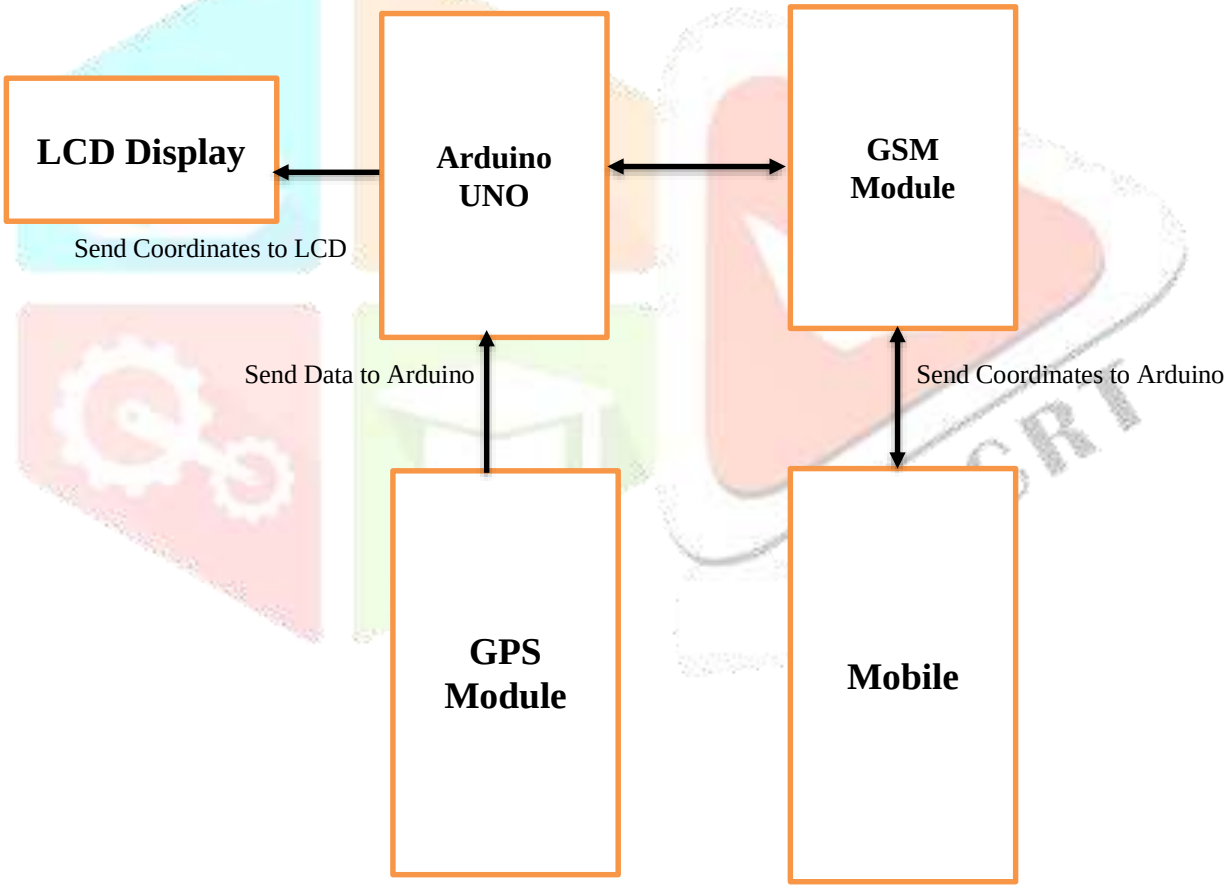

Figure 1: Block Diagram of Proposed System

For the first part of this project, the GPS receiver will be paired with the Arduino Uno. This part is essential to ensure smooth operation for the GPS receiver. A software will be develop using C programming language to operate the Arduino Uno. The next phase of this project is to integrate the GPS-Arduino Uno with the GSM module. The integration will need an addition of GPS modems to transmit the data from the GPS receiver to the computer for display.

The proposed system consists of Arduino UNO, GPS Module, GSM Module, LCD Display.

Arduino UNO: The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable

traction in the hobby and professional market. The Arduino is open-source, which means hardware is reasonably priced and development software is free. This guide is for students in ME 2011, or students anywhere who are confronting the Arduino for the first time. For advanced Arduino users, prowl the web; there are lots of resources. The Arduino project was started in Italy to develop low cost hardware for interaction design. An overview is on the Arduino. The Arduino hardware comes in several flavors. In the United States, Sparkfun is a good source for Arduino hardware.

Figure 2: Arduino UNO

With the Arduino board, you can write programs and create interface circuits to read switches and other sensors, and to control motors and lights with very little effort. Many of the pictures and drawings in this guide were taken from the documentation on the Arduino site, the place to turn if you need more information. The Arduino section on the ME 2011 web site, covers more on interfacing the Arduino to the real world.

The boards feature serial communications interfaces, including USB on some modules, for loading programs from personal computers. For programming the micro controllers, the Arduino project provides an integrated development environment based on the processing project which includes support for the programming languages. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats and motion detectors.

An important feature of the Arduino is that you can create a control program on the host PC, download it to the Arduino and it will run automatically. Remove the USB cable connection to the PC, and the program will still run from the top each time you push the reset button. Remove the battery and put the Arduino board in a closet for six months. When you reconnect the battery, the last program you stored will run. This means that you connect the board to the host PC to develop and debug your program, but once that is done, you no longer need the PC to run the program.

GPS Module: A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites high above the Earth. Each satellite continually transmits messages that include

- The time the message was transmitted
- Precise orbital information (the ephemeris)
- The general system health and rough orbits of all GPS satellites (the almanac).

The receiver uses the messages it receives to determine the transit time of each message and computes the distance to each satellite. These distances along with the satellites' locations are used with the possible aid of trilateration, depending on which algorithm is used, to compute the position of the receiver. This position is then displayed, perhaps with a moving map display or latitude and longitude; elevation information may be included. Many GPS units show derived information such as direction and speed, calculated from position changes.

Figure 3: GPS Module

Three satellites might seem enough to solve for position since space has three dimensions and a position near the Earth's surface can be assumed. However, even a very small clock error multiplied by the very large speed of light] the speed at which satellite signals propagate results in a large positional error. Therefore, receivers use four or more satellites to solve for the receiver's location and time. The very accurately computed time is effectively hidden by most GPS applications, which use only the location. A few specialized GPS applications do however use the time; these include time transfer, traffic signal timing, and synchronization of cell phone base stations.

Triangulation: The principle behind the unprecedented navigational capabilities of GPS is triangulation. To triangulate, a GPS receiver precisely measures the time it takes for a satellite signal to make its brief journey to Earth—less than a tenth of a second. Then it multiplies that time by the speed of a radio wave—300,000 km (186,000 miles) per second—to obtain the corresponding distance between it and the satellite. This puts the receiver somewhere on the surface of an imaginary sphere with a radius equal to its distance from the satellite.

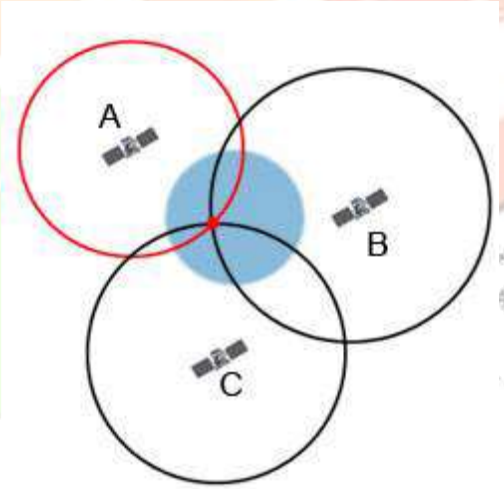

Figure 4: Triangulation/Trilateration method

When signals from three other satellites are similarly processed, the receiver's built-in computer calculates the point at which all four spheres intersect, effectively determining the user's current longitude, latitude, and altitude. (In theory, three satellites would normally provide an unambiguous three-dimensional fix, but in practice at least four are used to offset inaccuracy in the receiver's clock.) In addition, the receiver calculates current velocity (speed and direction) by measuring the instantaneous Doppler Effect shifts created by the combined motion of the same four satellites.

GSM Module: GSM networks consist of three major systems the Switching System (SS), Base station (BS) and the Mobile Station (MS). GSM Module is just like mobile system which consists of SIM card which can be placed in SIM card slot. This method of communication allows a path to be established between two devices. Once the two devices are connected, a constant stream of digital data is relayed. 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. GSM uses a process called Switching.

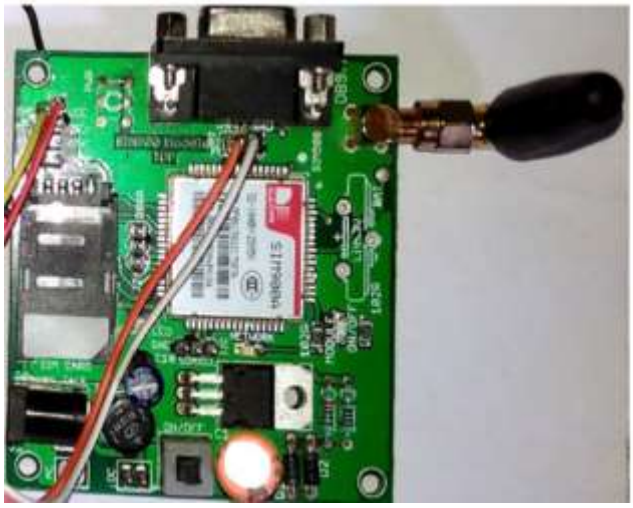

Figure 5: GSM Module

GSM that we have selected for our project is SIM 900. Maximum 160 characters per SMS are available. GSM uses 900 or 1800 MHz frequency Global System for Mobile Communication is the world's most popular standard for mobile telephony system. The GSM Association estimates that 80% of the global mobile market uses the standard.

GSM differs from its predecessor technologies in that both signaling and speech channels are digital, and thus GSM is considered a second-generation mobile phone system. This also facilitates the wide-spread implementation of data communication applications into the system.

LCD Display: Liquid crystal display stands for Liquid Crystal display. Liquid crystal display is finding wide unfold use replacing LEDs (seven section LEDs or other multi segment LEDs) because of the following reasons.

Figure 7: LCD

- The declining expenses of LCDs.
- The ability to show numbers, characters and portraits. this is in comparison to LEDs, which can be limited to numbers and a few characters.
- Incorporation of a clean controller into the LCD, thereby relieving the CPU of the mission of refreshing the liquid crystal display. In comparison, the LED ought to be refreshed by using the CPU to maintain displaying the records.
- Ease of programming for characters and snap shots. these additives are "specialized" for getting used with the microcontrollers, this means that that they can't be activated via general IC circuits. they may be used for writing specific messages on a miniature liquid crystal display.

V. ADVANTAGES OF THE PROPOSED SYSTEM

- For real time tracking the vehicle.

- Gives accurate location and distance travelled by vehicle.
- We can implement this product in all type of Vehicles.
- Less power requirements.

VI. APPLICATIONS OF THE PROPOSED SYSTEM

The project that has been introduced here can be used for variety of applications.

- Car navigation
- Fleet management/tracking
- Palmtop, Laptop, PDA, and Handheld
- Location Based Services enabled devices
- Security transportation.

VII. CONCLUSION

Vehicle tracking system makes better fleet management and which in turn brings large profits. The vehicle tracking used for positioning and navigating the vehicle with an accuracy of 10m,we can measure the exact location of the vehicle with the help of GOOGLE Maps. If anybody steals our car we can easily find our car around the globe. By keeping vehicle positioning vehicle on the vehicle. It will give more security.

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