# GPS System and its Application

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**Abstract- Irrespective of time, location, and whether, Global Position System provides unparalleled range of services to commercial military and consumer applications. Majority of these services enables airborne, land, and sea users to know their exact velocity, location, and time whenever and wherever on Earth. The development and capabilities of the GPS technology have rendered obsolete and impractical, other traditional positioning and well-known navigation systems and technologies such as magnetic compasses, radio-based devices, and chronometers among others. Global Positioning System consists of 24 satellites, 21 of which are active while three (3) are spares and are located at an altitude of 10600 miles above the surface of the earth (El-Rabbany, 2002). GPS receivers on the ground is fitted with computers that are capable of triangulating its own sense after obtaining bearings from the other three (4) of the four (4) GPS satellites located in the same horizon. GPS segments are categorized into three distinct segments that include space segment, control segment, and user segment. Global Positioning systems perform an array of functions on land, in air, or at sea. There are specific features that make GPS systems be attractive. These includes the ability to provide high positioning accuracies, the capability to determine accurate time and velocity accuracies, readily available signals in any part of the world, the free services at no charge, and all all-weather service delivery system (Andrews, Weill, and Grewal, 2007). Despite the above advantages, a number of challenges that still impede the transmission of signals still exist within the limits of GPS technologies.**

**Keywords-GPS, Tracking, segments, radio.**

## I. INTRODUCTION

Irrespective of time, location, and whether, *Global Position System* provides unparalleled range of services to commercial military and consumer applications. Majority of these services enables airborne, land, and sea users to know their exact velocity, location, and time whenever and wherever on Earth. The development and capabilities of the GPS technology have rendered obsolete and impractical, other traditional positioning and well-known navigation systems and technologies such as magnetic compasses, radio-based devices, and chronometers among others. Twenty-four (24) GPS satellites are strategically located 10, 600 miles from Earth and they are in circular orbits with each other (El-Rabbany, 2002). The orbital period is 12 hours, and satellites are distributed in six orbital planes with equally spaced angles. Out of the 24 GPS satellites, twenty-one (21) are active while three (3) are spaces. The GPS satellites are spaced in such a manner that four (4) *GPS satellites* will always be beyond the horizon. In terms of structure and composition, each GPS satellite is equipped with an atomic clock, a computer, and a radio. Each radio understands its own clock and orbit thereby enabling it to broadcast continuously any changes in time and position. For instance, any minor corrections are made on each day after each GPS satellite verifies its own sense of position and time with other stations located on the ground.

This hardware is fitted on the vehicle which is not visible to anyone who is inside or outside of the vehicle. Thus the system is not only tracks the location of the vehicle but also useful to detects the accident and location of the accident occurred and send continuously the location data in the form of message to the registered number and this is how we are providing a safety not only to the vehicle but also to the users. This new technology popularly called as "vehicle tracking system". Finally, advanced and specialized GPS receivers can be programmed to store vital data that are usable in map making and as well important for Geographic Information Systems.

## II. GLOBAL POSITIONING SYSTEMS AND THEIR HISTORY

Global Positioning Systems (GPS) refers to satellite-based radio-positioning systems and time-transfer systems that provide three-dimensional course, position, and time information to suitably equipped users. The radios sends, receives, and provides time and location information at any time, place, and weather provided the GPS radios are not obstructed from the four other orbital satellites. Other valuable information displayed by GPS technologies includes velocity and altitude. The U.S. Department of Defense designs, finances, and operates GPS systems while the USA owns the GPS technology. Other than the unparalleled advantages offered to the military, GPS systems have proven to be of fundamental benefits to the civilian community whereby GPS applications are used in rapidly expanding sets of applications. The Global Positioning System consists of 24 satellites that are in circular orbits around the Earth with the orbital period of approximately 12 hours (Kaplan, 1996). The satellites are distributed across six orbital planes that are equally spaced in angles. Each Global Positioning Satellite is built with an atomic clock, a computer, and a radio

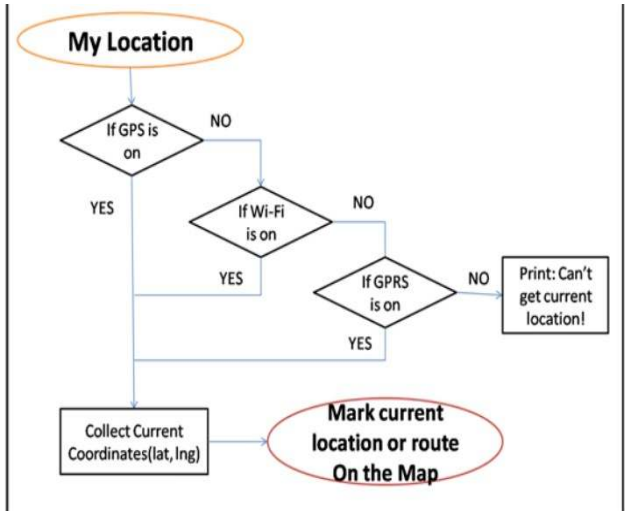


**Figure.(01)**showing the working of GPS

The history of GPS systems can be traced to 1973 when the United States Department of Defense began to develop a 24-hour, all-weather global positioning system to provide support for the positioning requirements of US armed forces. The GPS was formerly referred to as the NAVSTAR (Navigation Satellite Timing and Ranging). Ideally, the GPS system was designed as a form of replacement to already large navigational system that was already in use, and as well, the need to obtain reliability and survivability for navigation systems in handling a wide variety of dynamics (Kaplan, 1996; Parkinson, and Spilker 1996). Other motives that initiated the development of GPS Technology included the need for a system to service unlimited users, and a system that does not require the transmission of signals from users to satellites. Eventually, it led to the design of a system that surpassed the intended concepts such that a one-way system was developed to transmit signals with no receiving functions. This function was essential in that enemies could not detect signals being relayed within the confines of the military. Additionally, the developed system used microwave transmission technology, was equipped with the latest atomic clocks, could transmit signals regardless of the prevailing weather conditions, and provided accurate navigation and positioning details (Parkinson, and Spilker 1996). Due to the relatively cheap cost and inexpensive equipment, the GPS technology was availed freely to the civilian population.

## III. METHODOLOGY

This project consist of GPS receivers and GSM modem with a microcontroller and the whole device is attached to the vehicle. The GPS system will send the latitude and longitude values corresponding to the position of the vehicle, the SMS will be send to the GSM modem and the then to the microcontroller and finally a data will be received in the form of message in the registered mobile number. Also the message will only be received if its matches to the password which is already being registered. So the owner can only access it and nobody can other use it, and it will only track if it matches to the registered number.

For e.g. if the vehicle is stolen we can easily get its location by simply sending a message i.e. already set in the GSM and the device will send back the response to the registered number and we will easily get its location in the form of latitude and longitude Value.

The password of the devices can later be changed according to the user and nobody can see the devices wo is inside or outside the vehicle.

In this proposed work, a novel method of vehicle tracking and locking system used to track the theft by vehicle by using GPS and GSM technology. This system puts into sleeping mode while the vehicle handled by the owner or authorized person otherwise goes to active mode, the mode of operation changed by in person or remotely. If any interruption occurred in any side of the door, microcontroller is interrupted and SMS is send to the microcontroller, the controller issue the message about place of the vehicle to the car owner or authorized person. When send SMS to the controller, issue the control signalsTo the engine motors. Engine motor speeds gradually decreases and come to the off place. After that all the doors locked. To open the door or restart the engine, authorized person needs to enter the passwords, in this method ,tracking of vehicle place easy and doors locked automatically, thereby thief cannot get away from the car.

In today's world as the population increases day by day the numbers of vehicle also increases on the roads and highways. This result more in accident on the interns leads to the traffic jams and public get help instantaneously. This module provides information about the accident to the hospital and police station. As a result sudden help public life may save and the traffic jams are reduced. To improve the level of supervision and management for cargo transport vehicles, especially trucks carrying coal it is important to develop transport vehicles remote monitoring module . A server computer at the (remote)monitoring station that is also waiting for the system, should record the action of the vehicle into a database. This contains the information regarding vehicle velocity, position, identity and temperature in two fashions. The information given to monitoring station is in continuous manner and when the accident occurs. The development of vehicular design brings public many convenience in life but also brings many problems at the same time, for example, traffic congestion, difficulty in

monitoring dispersive vehicle, theft and other serious problems. We are intended to made this monitoring wireless using ARM7 hardware platform ported with real time operating system µc/OS-II.

## IV. APPLICATIONS OF GPS TECHNOLOGY

GPS technology has matured into a resource that goes far beyond its original design goals. These days people from a plethora of profession are using GPS in ways that make their work more productive, safer, and sometimes even easier.

**THERE ARE FIVE MAIN USES OF GPS TODAY:-**

1. Location- determining a basic position.
2. Navigation-getting from one location to another.
3. Tracking-monitoring the movement of people and things.
4. Mapping-creating maps.
5. Timing-provide precise timing.

**THE APPLICATIONS OF GPS ARE AS FOLLOWS :-**

### 1.INTELLIGENT VEHICLE CONTROL AND MONITORING USING GPS

The Vehicular System provides information of a vehicle like velocity, 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. 760Accelerometer senses the collision of the vehicle

and sends this information in real time to a hospital/police station.

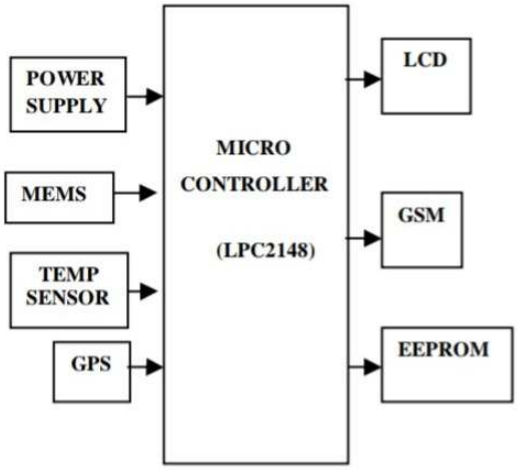


**Figure.(03)**Showing the intelligent vehicle control and monitoring using GMS and GPS.

The monitoring station display these information on GUI also stored these information in database for further process according to a program. The system is useful in much application such as surveillance, security, tracking, which may be installed in cargo trucks, cars, motorcycle, and boat. The system can be used in many applications.

### 2.VEHICLE THEFT DETECTION AND TRACKING BASED ON GMS AND GPS

we have proposed a novel method of vehicle tracking and locking systems used to track the theft vehicle by using GPS technology. This system puts into the sleeping mode vehicle handled by the owner or authorized persons; otherwise goes to active mode.

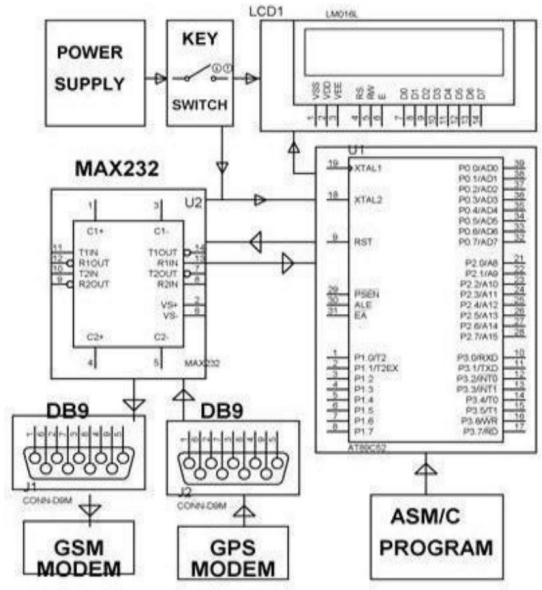


**Figure.(04)**Shows the block diagram of vehicle tracking and locking system based on GSM and GPS technology.

The mode of operations changed by persons or remotely. When the theft identified, the responsible people send SMS to the micro controller, then issue the control signals to stop the engine motor. After that all the doors locked. To open the doors or to restart the engine authorized person needs to enter the passwords. In this method, easily track the vehicle place and doors locked.

### 3.SYSTEM DETECTING AIR POLLUTION AND TRACKING USING GMS AND GPS

Vehicles and Industries are the major origin of Environmental Pollution. Every vehicle will have

emission but the problem occurs, which is due to the improper maintenance of vehicles. This emission from vehicles cannot be completely avert but, it definitely can be controlled. As a solution to the above problems we aim to build an automated control system for emission level detection in vehicles and indicate this level with a meter. When the pollution/ emission level shoots beyond the already set threshold level, there will be a buzz in the vehicle to indicate that the limit has been breached and this information has been send to traffic control room which includes vehicle number, owner details and location of the vehicle by using GPS.

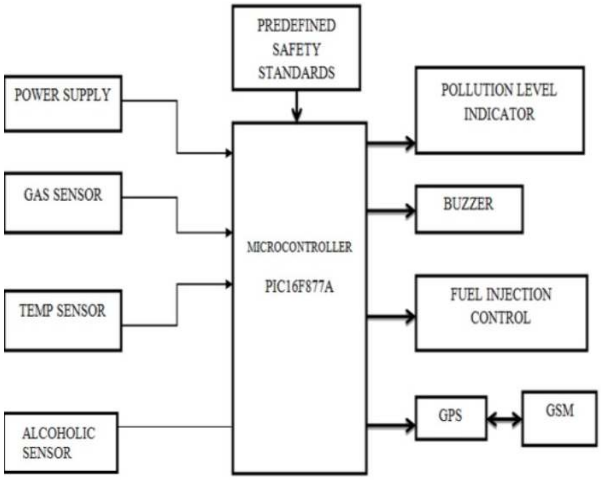


**Figure.(05)**Showing the working of GPS on air pollution.

In future we can add additional features like traffic police have an authority to stop the vehicle remotely by sending a SMS using GSM. This paper, when aggrandize as a real time project, will asset the society and help in reducing the air pollution.

#### 4.VEHICLE TRACKING SYSTEM USING GMS AND GPS

This hardware is fitted on the vehicle which is not visible to anyone who is inside or outside of the vehicle. Thus the system is not only tracks the location of the vehicle but also useful to detects the accident and location of the accident occurred and send continuously the location data in the form of message to the registered number and this is how we are providing a safety not only to the vehicle but also to the users. This new technology popularly called as "vehicle tracking system". The figure.(06) shows the working of GPS on vehicle tracking system.

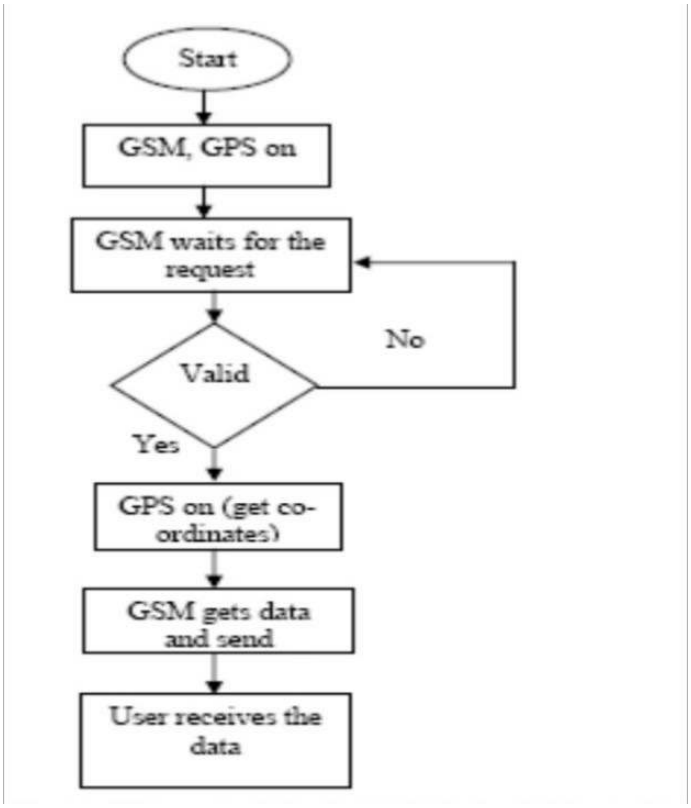


**Figure.(06)**shows the flowchart of vehicle tracking system.

## V. ACCURACY OF GLOBAL POSITION SYSTEMS

The accuracy of GPS systems depends with the precision of signals that emanate from GPS satellites to GPS receivers. Additionally, the number of obstacles that can obscure your receiver from the GPS systems are critical in the determining the precision and accuracy of information obtained from GPS systems.

The types of receivers also play a significant role in the determination of GPS accuracy. Majority of GPS receivers have an accuracy range of +/- 10m. Other accurate forms of GPS receivers include Differential Global Positioning Systems (DGPS). The accuracy of most GPS systems is affected by errors.

Common sources of errors to GPS systems include inaccuracies associated with the reported location of satellites (orbital errors), receiver clock errors, signal multipath that makes GPS signals bounce off objects, and number of visible satellites, which can affect position reading or impede signal reception (Tsui, 2005). Satellite Shading also affects the accuracy of the information. For instance, the ideal satellite geometry is achieved when satellites are widely located at angles that are relative to one another.

## VI. GPS COMPETITORS

The closest competitor of GPS technology is the Wide Are Augmentation System (WAAS) that consists of satellites and ground stations capable of providing accurate positioning. The WAAS technology was developed by the Federal Aviation Administration (FAA). A good example of WAAS is the European Geostationary Navigation Overlay Service (EGNOS). The WAAS program was specifically developed to assist pilots is determining direct en route paths, identifying precision approach services to runways, and to ensure maximum capacity and safety improvements in all weather conditions (Tsui, 2005). WAAS users are required to have WAAS-capable receivers to enable them obtain signals in areas covered by WAAS satellites.

## VII. CONCLUSION

The analysis and discussion of Global Positioning System concepts has revealed that GPS technology is a force in the force. Perhaps the system designers had different intentions when developing and designing GPS technologies but these applications have added to the versatility of usage of GPS not only as a system for estimating the precise positioning of objects but also in the provision of accurate and reliable navigation information. Irrespective of time, location, and whether, Global Position System provides unparalleled range of services to commercial military and consumer applications. Majority of these services enables airborne, land, and sea users to know their exact velocity, location, and time whenever and wherever on Earth. Indeed, the GPS technology supports numerous positioning and navigation applications that satisfy a multitude of user needs. At this moment, the widespread usage of GPS applications in different sectors of the economy makes it exceedingly difficult to think of a life without **Global Positioning Systems**. It is evident that creating a complex system such as the GPS technology is not an easy task and this can be proven from the few competitors of GPS technology. GPS technologies and systems are used in different sectors of society. This includes road and rail transportation, marine navigation, agriculture, the airline industry, space science, recreation, military, and in the provision of public safety among others. Information and signals relayed by GPS systems are safe and reliable thereby making GPS technology the ideal navigation and positioning equipment.

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