AN AUTOMATIC EMBEDDED VEHICLE MANAGEMENT SYSTEM

1. Mr. Mudide Ramprasad, M.Tech (ES), Dept. of ECE, Ramappa Engineering college,
2. Mr. Chunchu Venugopal, M.Tech (SE), Dept. of CSE, Ramappa Engineering college,
3. Mr.Dumpeti Sathish, M.Tech (SE), Dept. of CSE, Aurora Engineering college,

ABSTRACT:

Vehicle thefts and maintenance information regarding the vehicle location and condition of the vehicle can be done by using an automatic embedded vehicle management system. These issues mainly based on the GSM and GPS controls embedded into the vehicle which is responsible for vehicle location, condition and coordination with the centralized switching office.

The smart car can also be remotely locked or unlocked using GSM modem. Another feature of navigation and tracking of car using GPS module is also included in the system. The system takes latitude and longitude positions from GPS and sends to the PC using GSM modem. The real time location of the car is further displayed on the map on PC.

The GSM, GPS modems are interfacing with ARM microcontrollers. ARM microcontrollers are controlling the sensors and these two modems.

1. INTRODUCTION:

An embedded system is a computer system designed to perform one or a few dedicated functions often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. By contrast, a general-purpose computer, such as a personal computer (PC), is designed to be flexible and to meet a wide range of end-user needs. Embedded systems control many devices in common use today [1].

Embedded systems are controlled by one or more main processing cores that are typically either microcontrollers or digital signal processors (DSP). The key characteristic, however, is being dedicated to handle a particular task, which may require very powerful processors. For example, air traffic control systems may usefully be viewed as embedded, even though they involve mainframe computers and dedicated regional and national networks between airports and radar sites. (Each radar probably includes one or more embedded systems of its own.).

Physically embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

The status of car door locks can also be checked through Short Message Services (SMS) using GSM modem. The authorized user sends particular SMS to the GSM modem in the car and it will reply the current status of car locks. The authorize driver can also lock or unlock the car remotely by sending SMS to the GSM modem connected with the car.

The system has an advance feature of GPS, which provides navigation and tracking of the car. It gives the position of latitude and longitude to the micro-controller. The micro-controller further sends these values to the user PC using GSM modem. The GSM modem sends the SMS messages regularly to the mobile connected with the PC for navigation. The exact location of the car is also plotted on the map [2].
2. SYSTEM DESIGN:
A vehicle tracking system combines the installation of an electronic device in a vehicle, or fleet of vehicles, with purpose-designed computer software at least at one operational base to enable the owner or a third party to track the vehicle's location, collecting data in the process from the field and deliver it to the base of operation. Modern vehicle tracking systems commonly use GPS or GLONASS technology for locating the vehicle, but other types of automatic vehicle location technology can also be used. Vehicle information can be viewed on electronic maps via the Internet or specialized software. Urban public transit authorities are an increasingly common user of vehicle tracking systems, particularly in large cities.

Most commonly, the location is determined using GPS, and the transmission mechanism is SMS, GPRS, a satellite or terrestrial radio from the vehicle to a radio receiver. GSM and EVDO are the most common services applied, because of the low data rate needed for AVL [3], and the low cost and near-ubiquitous nature of these public networks. The low bandwidth requirements also allow for satellite technology to receive telemetry data at a moderately higher cost, but across a global coverage area and into very remote locations not covered well by terrestrial radio or public carriers. Other options for determining actual location, for example in environments where GPS illumination is poor, are dead reckoning, i.e. inertial navigation, or active RFID systems or cooperative RTLS systems. With advantage, combinations of these systems may be applied. In addition, terrestrial radio positioning systems utilizing an LF (Low Frequency) switched packet radio network were also used as an alternative to GPS based systems.

Applications:
Application with vehicles
Automatic vehicle locating is a powerful concept for managing fleets of vehicles, as service vehicles, emergency vehicles, and especially precious construction equipment, also public transport vehicles (buses and trains). It is also used to track mobile assets, such as non-wheeled construction equipment, non-motorized trailers, and mobile power generators.

Application with vehicle drivers and crews
The other purpose of tracking is to provide graded service or to manage a large driver and crewing staff effectively. For example, suppose an ambulance fleet has an objective of arriving at the location of a call for service within six minutes of receiving the request. Using an AVL system allows to evaluate the locations of all vehicles in service with driver and other crew in order to pick the vehicle that will most likely arrive at the destination fastest, (meeting the service objective)[4].

Background:
Types of systems
Simple direction finding
Amateur radio and some cellular or PCS wireless systems use direction finding or triangulation of transmitter signals radiated by the mobile. This is sometimes called radio direction finding or RDF. The simplest forms of these systems calculate the bearing from two fixed sites to the mobile. This creates a triangle with endpoints at the two fixed points and the mobile. Trigonometry tells you roughly where the mobile transmitter is located. In wireless telephone systems, the phones transmit continually when off-hook, making continual tracking and the collection of many location samples possible. This is one type of location system required by Federal Communications Commission Rules for wireless Enhanced 911.

Former LORAN-based locating
Motorola offered a 1970s-era system based on the United States Coast Guard LORAN maritime navigation system. The LORAN system was intended for ships but signal levels on the US east- and west-coast areas were adequate for use with receivers in automobiles. The system may have been marketed under the Motorola model name Metricom. It consisted of an LF LORAN receiver and data interface box/modem connected to a separate two-way radio. The receiver and interface calculated a latitude and longitude in degrees, decimal degrees format based on the LORAN
signals. This was sent over the radio as MDC-1200 or MDC-4800 data to a system controller, which plotted the mobile's approximate location on a map. The system worked reliably but sometimes had problems with electrical noise in urban areas. Sparking electric trolley poles or industrial plants which radiated electrical noise sometimes overwhelmed the LORAN signals, affecting the system's ability to determine the mobile's geolocation. Because of the limited resolution, this type of system was impractical for small communities or operational areas such as a pit mine or port.

**Signpost systems**

To track and locate vehicles along fixed routes, a technology called *signpost transmitters* is employed. This is used on transit routes and rail lines where the vehicles to be tracked continually operated on the same linear route. A transponder or RFID chip along the vehicle route would be polled as the train or bus traverses its route. As each transponder was passed, the moving vehicle would query and receive an ack, or handshake, from the signpost transmitter. A transmitter on the mobile would report passing the signpost to a system controller. This allows supervision, a call center, or a dispatch center to monitor the progress of the vehicle and assess whether or not the vehicle was on schedule. These systems are an alternative inside tunnels or other conveyances where GPS signals are blocked by terrain [5].

**Today's GPS-based locating**

The low price and ubiquity of Global Positioning System or GPS equipment has lent itself to more accurate and reliable telelocation systems. GPS signals are impervious to most electrical noise sources and don't require the user to install an entire system. Usually only a receiver to collect signals from the satellite segment is installed in each vehicle and radio or GSM to communicate the collected location data with a dispatch point.

AVL systems send data from GPS receivers in vehicles to a dispatch center over their private, user-owned radio backbone. These systems are used for businesses like parcel delivery and ambulances. Smaller systems which don't justify building a separate radio system use cellular or PCS data services to communicate location data from vehicles to their dispatching center. Location data is periodically polled from each vehicle in a fleet by a central controller or computer. In the simplest systems, data from the GPS receiver is displayed on a map allowing humans to determine the location of each vehicle.

**Sensor-augmented AVL**

The main purpose of using AVL is not only to locate the vehicles, but also to obtain information about engine data, fuel consumption, driver data and sensor data from i.e. doors, freezer room on trucks or air pressure. Such data can be obtained via the CAN-bus, via direct connections to AVL systems or via open bus systems such as UFDEX that both sends and receives data via SMS or GPRS in pure ASCII text format. Because most AVL consists of two parts, GPS and GSM modem with additional embedded AVL software contained in a microcontroller, most AVL systems are fixed for its purposes unless they connect to an open bus system for expansion possibilities.

With an open bus system the users can send invoices based on goods delivered with exact location, time and date data where if connected to scale, RFID or barcode readers, can make a fairly good automated system to avoid human errors. In countries with high prices on gasoline external fuel sensors are used to prevent cases of fuel theft [6]

**Logbook functions**

Another scenario for sensor functions is to connect the AVL to driver information, to collect data about driving time, stops, or even driver absence from the vehicle. If the driver/worker conditions is such as the hourly rates for driving and working outside is not the same, this can be monitored by sensors, by using iButton or other personal identification devices. Later by analyzing log-file it is possible to get reports on any kind of events, like stops, visited streets, speed limits violations, etc [7]

**A.V.L (Automatic Vehicle Location)** This type of vehicle tracking is normally used in the fleet or driver management sector. The unit is configured to automatically transmit its
location at a set time interval, e.g. every 5 minutes. The unit is activated when the ignition is switched on/off.

E.A.T.S (Events Activated Tracking system) This type of system is primarily used in connection with vehicle or driver security solutions. If, for example a thief breaks into your car and attempts to steal it, the tracking system can be triggered by the immobilizer unit or motion sensor being activated. A monitoring bureau will then be automatically notified that the unit has been activated and begin tracking the vehicle.

**Typical Architecture**

Major constituents of the GPS based tracking are

1. **GPS tracking device**: The device fits into the vehicle and captures the GPS location information apart from other vehicle information at regular intervals to a central server. The other vehicle information can include fuel amount, engine temperature, altitude, reverse geocoding, door open/close, tire pressure, cut off fuel, turn off ignition, turn on headlight, turn on taillight, battery status, GSM area code/cell code decoded, number of GPS satellites in view, glass open/close, fuel amount, emergency button status, cumulative idling, computed odometer, engine RPM, throttle position, and a lot more. Capability of these devices actually decides the final capability of the whole tracking system.

2. **GPS tracking server**: The tracking server has three responsibilities: receiving data from the GPS tracking unit, securely storing it, and serving this information on demand to the user.

3. **User interface**: The UI determines how one will be able to access information, view vehicle data, and elicit important details from it.

**Common Uses**

Vehicle tracking systems are commonly used by fleet operators for fleet management functions such as fleet tracking, routing, dispatch, on-board information and security. Along with commercial fleet operators, urban transit agencies use the technology for a number of purposes, including monitoring schedule adherence of buses in service, triggering changes of buses' destination sign displays at the end of the line (or other set location along a bus route), and triggering pre-recorded announcements for passengers. The American Public Transportation Association estimated that, at the beginning of 2009, around half of all transit buses in the United States were already using a GPS-based vehicle tracking system to trigger automated stop announcements. This can refer to external announcements (triggered by the opening of the bus's door) at a bus stop, announcing the vehicle's route number and destination, primarily for the benefit of visually impaired customers, or to internal announcements (to passengers already on board) identifying the next stop, as the bus (or tram) approaches a stop, or both. Data collected as a transit vehicle follows its route is often continuously fed into a computer program which compares the vehicle's actual location and time with its schedule, and in turn produces a frequently updating display for the driver, telling him/her how early or late he/she is at any given time, potentially making it easier to adhere more closely to the published schedule. Such programs are also used to provide customers with real-time information as to
the waiting time until arrival of the next bus or tram/streetcar at a given stop, based on the nearest vehicles' actual progress at the time, rather than merely giving information as to the scheduled time of the next arrival. Transit systems providing this kind of information assign a unique number to each stop, and waiting passengers can obtain information by entering the stop number into an automated telephone system or an application on the transit system's website. Some transit agencies provide a virtual map on their website, with icons depicting the current locations of buses in service on each route, for customers' information, while others provide such information only to dispatchers or other employees.

Other scenarios in which this technology is employed include:

- **Stolen vehicle recovery:** Both consumer and commercial vehicles can be outfitted with RF or GPS units to allow police to do tracking and recovery. In the case of LoJack, the police can activate the tracking unit in the vehicle directly and follow tracking signals.

- **Fleet management:** When managing a fleet of vehicles, knowing the real-time location of all drivers allows management to meet customer needs more efficiently. Whether it is delivery, service or other multi-vehicle enterprises, drivers now only need a mobile phone with telephony or Internet connection to be inexpensively tracked by and dispatched efficiently.

- **Asset tracking:** 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.

- **Field service management:** Companies with a field service workforce for services such as repair or maintenance, must be able to plan field workers’ time, schedule subsequent customer visits and be able to operate these departments efficiently. Vehicle tracking allows companies to quickly locate a field engineer and dispatch the closest one to meet a new customer request or provide site arrival information.

- **Field sales:** Mobile sales professionals can 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 include increased productivity, reduced driving time and increased time spent with customers and prospects.

- **Trailer tracking:** Haulage and Logistics companies often operate lorries with detachable load carrying units. The part of the vehicle that drives the load is known as the cab and the load carrying unit is known as the trailer. There are different types of trailer used for different applications, e.g., flat bed, refrigerated, curtain sider, box container.

- **Surveillance:** A tracker may be placed on a vehicle to follow the vehicle's movements.

- **Transit tracking:** This is the temporary tracking of assets or cargoes from one point to another. Users will ensure that the assets do not stop on route or do a U-Turn in order to ensure the security of the assets.
3. WORKING OF THE SYSTEM:

Temperature Sensor Types

The most commonly used type of all the sensors are those which detect Temperature or heat. These types of temperature sensor vary from simple ON/OFF thermostatic devices which control a domestic hot water system to highly sensitive semiconductor types that can control complex process control plants. We remember from our school science classes that the movement of molecules and atoms produces heat (kinetic energy) and the more movement, the more heat is generated. Temperature Sensors measure the amount of heat energy or even coldness that is generated by an object or system, and can "sense" or detect any physical change to that temperature producing either an analogue or digital output.

The Thermostat is a contact type electro-mechanical temperature sensor or switch, that basically consists of two different metals such as nickel, copper, tungsten or aluminium etc, that are bonded together to form a Bi-metallic strip. The different linear expansion rates of the two dissimilar metals produces a mechanical bending movement when the strip is subjected to heat. The bi-metallic strip is used as a switch in the thermostat and are used extensively to control hot water heating elements in boilers, furnaces, hot water storage tanks as well as in vehicle radiator cooling systems.

Carbon dioxide sensor

A carbon dioxide sensor or CO₂ sensor is an instrument for the measurement of carbon dioxide gas. The most common principles for CO₂ sensors are infrared gas sensors (NDIR) and chemical gas sensors. Measuring carbon dioxide is important in monitoring indoor air quality and many industrial processes.

Chemical CO₂ gas sensors with sensitive layers based on polymer- or heteropolysiloxane have the principal advantage of very low energy consumption and can be reduced in size to fit into microelectronic-based systems. On the downside, short- and long term drift effects as well as a rather low overall lifetime are major obstacles when compared with the NDIR measurement principle.

GLASS BREAK SENSOR

A glass break detector is a sensor used in electronic burglar alarms that detects if a pane of glass is shattered or broken. These sensors are commonly used near glass doors or glass store-front windows to detect if an intruder broke the glass and entered.

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.

**Definition of GSM:**

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services.

GSM (Global System for Mobile communication) is a digital mobile telephone system that is widely used in Europe and other parts of the world. GSM uses a variation of Time Division Multiple Access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1,800 MHz frequency band and supports voice calls and data transfer speeds of up to 9.6 Kbit/s, together with the transmission of SMS (Short Message Service).

**CONCLUSION:**

The procedure starts with GSM system, it activated first then given one SMS to our mobile. The vehicle starts now, then after GPS is activated it is tracked with vehicle. These two modules is interfacing with ARM processor and it indicated the vehicle condition that means vehicle theft information, if vehicle is stolen then find the location of the vehicle. This system mostly used personal and a public vehicle because the persons are waiting time is reduced and more security system but it is cost effectively.

The complete system is controlled by LPC2148 microcontroller which is the main controlling unit in the system. For car tracking, the Garmin GPS is also used which sends the current location of the car through SMS using GSM modem connected with the microcontroller. The authorized user can also monitor and control the status of car locks through SMS. The specific command word is sent to the GSM modem for checking and controlling the car locks.

**FUTURE SCOPE:**

For future enhancements in the system, video calling can also be provided using the media processor and mobile connectivity using WIMEX technology. Media processor can also be used to provide IPTV if it is connected to internet so the user can monitor his car. In future air-conditioning system can also be connected to smart system so user can start the car and heating and cooling system according to weather in advance so environment will become pleasant before driver used it.

Two different method of computer implementation, single and web base, are discussed to display the vehicle location in the digital map. Then notes are explained about different methods being in the world to convert points coordinate from three to two dimensional coordinate. In continue, LAMBERT method already been used in IRAN is discussed and then it’s result that LAMBERT method, for testing points and making a ready Data Base to match points coordinate sent, should be used. After that, formulation and quantity for converting points sent to match able points in Data Base required, is discussed and approximately analyzed.

**REFERENCES:**


International conference on electronics and communication, pp.7, March 2006.


5. ^ For an example of one US signpost system, see its service manual: T1919A Metrocom II 150.8-174 MHz Vehicle Location Receiver. (Schaumburg, Illinois: Motorola Communications and Electronics, 1979).


