AUTOMATIC VEHICLE LOCATOR

NANDITHA.D

B.E. (3/4)-ECE

M.V.S.R. ENGINEERING COLLEGE

E-mail: duddunanditha@gmail.com

Abstract

Is your car or a vehicle stolen or is it not visible in the thickest snow or is one among the several cars present? Do you wa nt to know the arrival of the bus for which you are waiting? Are your children going alone in a vehicle and you want to track their moments? Does your cargo consists of costly load and want to protect them? Do you want to keep track of your little playing kids about where they are?

ANS: ***Automatic Vehicle Locator.***

This Paper gives us a novel approach of using certain GPS technology in tracking not only vehicles, but even children and to protect precious goods. So this technology has gained a lot of importance in the recent years. This paper tells us how this technology works, its applications. It is still under research and development stage.

1. AUTOMATIC VEHICLE LOCATOR

Automatic vehicle location (AVL) is a computer-based vehicle tracking system. For transit, the actual real-time position of each vehicle is determined and relayed to a control center. Actual position determination and relay techniques vary, depending on the needs of the transit system and the technologies employed. Transit agencies often incorporate other advanced system features in conjunction with AVL system implementation. Simple AVL systems include: computer-aided dispatch software, mobile data terminals, emergency alarms, and digital communications. More sophisticated AVL Systems may integrate: real-time passenger information, automatic passenger counters, and automated fare payment systems.

Other components that may be integrated with AVL systems include automatic stop annunciation, automated destination signs, Vehicle component monitoring, and Traffic signal priority.

AVL technology allows improved schedule adherence and timed transfers, more accessible passenger information, increased availability of data for transit management and planning, efficiency/productivity improvements in transit services.

2. What is AVL technology?

Automated Vehicle Locator (AVL) systems use satellite and land communications to display each vehicle's location, status, heading, and speed on the computer's screen. AVL systems use one of four types of navigation technology, or may combine two of these technologies to compensate for inevitable shortcomings of any one technology.

The four principal technologies employed for AVL systems are:

1. Global Positioning System

2. Dead-Reckoning System

3. Signpost/Odometer Systems

4. Radio Navigation/Location

3. TRACKING SYSTEMS

There are two types of tracking systems.

3.1. PASSIVE TRACKING: The Passive Tracking System modality refers to stand-alone GPS Receivers**,** which store data for further process. Passive systems are typically limited to vehicle tracking only. When a Passive Tracking Device is installed in a vehicle, the location, time, velocity and heading data is usually stored in the unit or transferred to a handheld device and downloaded from the vehicle when the vehicle returns to their base station.

3.2. REAL TIME TRACKING

Real Time Tracking Systems are based on mobile stand-alone terminals which combine GPS and GSM technology to determinate and transmit their position. A two-way wireless communication link connects the unit with the control center at all times. A portable GPS tracking device can be used as an emergency cellular phone with speed dialing for two-way voice communication. It can silently call any emergency number in the world for immediate assistance. The emergency silent call feature also provides a digitized voice message which can report the time, date, speed, heading, and location of a person in distress.

Figure1. GPS Receiver

The AVL tracking system consists of a GPS receiver inside the vehicle and a communications link between the vehicle and the control Center as well as pc-based tracking software for dispatch. The communication system is usually a cellular network similar to the one used by cellular phone. Currently all kind of communications networks permit Real-Time Tracking for mobile assets.

4. WORKING OF A GPS BASED AUTOMATIC VEHICLE LOCATOR

4.1. GPS SATELLITES

The GPS satellites locate the transit vehicles by sending out GPS signals to be picked up by vehicles GPS UNITS. The GPS unit in the vehicle absorbs the signals and gives radio signals to the RADIO system.

Figure2. A GPS Based AVL System

4.2. RADIO SYSTEM

The RADIO systems receive the vehicle GEO-LOCATION coordinates and transmits this radio signals to communication center.

4.3. COMMUNICATION CENTER

The communication center receives this information and uses it to determine the location of transit vehicle and sends this to dispatch stations and other stations for further analysis of the information either through wire line or wireless networks.

4.4. DISPATCH SECTION

The dispatch section uses the vehicle information to help maintain transit schedules and provide operational support to the drivers.

4.5. CUSTOMER ASSISTANCE UNIT

The customer assistance planning/scheduling operations analysis unit also receives the vehicle location information through wire line or wireless network. This section use vehicle location map to help maintain transit schedules to analyze and provide traffic information for other road way driver.

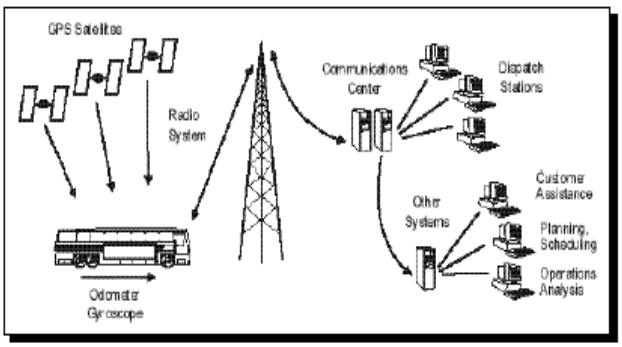


Figure3. Working of a GPS based AVL

5. INTEGRATING AVL WITH OTHER SYSTEMS

Buses equipped with AVL offer many possibilities for transit interface with highway and traffic organizations or transportation management centers. Opportunities include: providing transit buses with traffic signal priority; obtaining traffic congestion data at the dispatch center to allow rerouting of buses or informing customers of delay; incorporating transit information in traveler information systems; developing multi-application electronic payment systems; using buses to automatically communicate traffic speed; and reporting of roadway incidents by transit vehicle operators.

6. MORE ABOUT GPS

6.1. Use of Differential GPS

For AVL systems which do require more accurate positions, differential GPS can be employed. These systems normally employ the transmission of correction information to the GPS receiver; this correction information has corrections for each satellite in view. This is done because each satellite has its own error; the error in GPS is not simply an X-Y error which will be the same for all receivers. The error on any two given receivers will only be the same if those receivers are using the SAME satellites. This can't normally be guaranteed as satellites may be obscured at one location, making the error slightly different for two receivers.

6.2. GPS Antennas

The best position for any antenna is generally as high as possible with the best unrestricted view.

6.3. GPS Satellites

The global positioning system (GPS) was specifically engineered so that at least four of the 24 satellites would be positioned on the horizon at all times. There are six different orbiting patterns that the GPS satellites follow, making a complete trip around the earth every 12 hours. The information regarding the location of the transit

vehicle is calculated by TRILATERATION method. With this information, the receivers can, by a process similar to triangulation, tell the user the exact location in latitude, longitude, and sometimes altitude too.

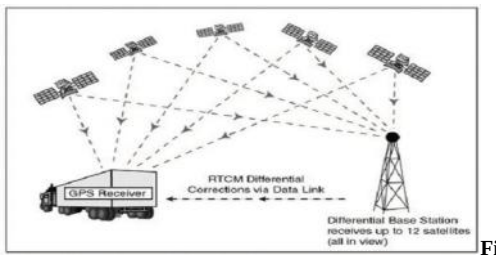


Figure4. GPS Satellites

6.4. MAPPING

At any control station, data is normally required to be viewed on a map. Maps allow a tangible, understandable view of a vehicles location, and will also allow operators to apply local knowledge.

7. DATA TRANSFER

The two most common methods of transmitting vehicle location data to dispatch are through polling and exception reporting via wireless communications. Many agencies use a combination.

8. BENEFITS

The most extensive and rigorous research into the benefits of AVL has found that this technology has lead to significant transit firm productivity gains (whether output is measured by Passenger Miles or Vehicle Revenue Miles). Benefits have been documented to varying degrees for all of the following categories.

8.1. Operations: Increases transit rider ship. Reduced need for additional road supervisors and manual data entry.

8.2. Communications: Improved communications between supervisors, dispatchers, and operators and reduced voice radio traffic.

8.3. Passenger Information: Provides capability to inform passengers of predicted bus arrival times thus enhancing the quality of transit service and allowing travelers to make better travel decisions.

8.4. Scheduling and Planning: Provides more complete and accurate data for scheduling and planning. Aids in effective bus stop placement (when combined with a G.I.S. database and automatic passenger counters).

8.5. Safety and Security: Enhances the security of the driver and traveler (particularly when coupled with silent alarm technology).

9. USES

1. Vehicle location display in real-time.
2. Recording of arrival and departure times (proof of delivery etc).

3. Monitoring of driving practices (speed).
4. Alerts if vehicle leaves or enters a defined area .

10. APPLICATIONS IN OTHER FIELDS

10.1. In Military

It is clear how useful this technology would be for the Armed Forces. Before small GPS receivers were available, troops in the field depended on the same technology for generations: the compass, sextant, maps and hand calculations. Radios and reconnaissance aircraft were great leaps, but a GPS calculates position in real time, down to three foot accuracy!

10.2. Geo-Caching

This is for people who have liking towards searching hidden things or participating in scavenger hunts. With GPS, comes the new twist: geo-caching. Geo-catchers hide a little treasure in a box public place, for example, a shoe box with a used book inside, taped under the seat of a bus stop. They then go to geo-caching websites and post simple latitude and longitude, to as much accuracy as they like. Then other geo-catchers search for these boxes with their GPS data. The fun is looking for a strange box in what could be an area with a 25-foot radius. When the successful geo-catcher finds the box, he or she keeps the little treasure and replaces it with another, for the next searcher.

10.3. Track Anything

Parents always worry about their teenage kids, especially after they start driving. Auto shops have started offering installation of small, hidden GPS receivers in kids' cars. Parents can then use simple computer software and have their kids' movements plotted on a map. Many parents don't even tell the kids about this 'little extra'.

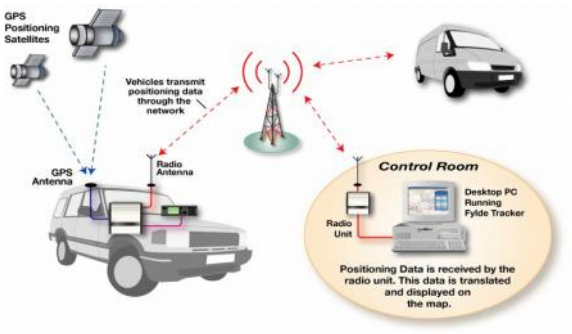


Figure5. Track anything

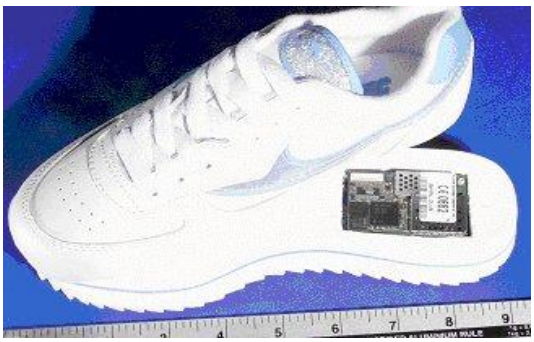
10.4. In Cargo

Some containers of cargo are more valuable than others. A small GPS receiver inside the cargo can know exactly where it is, how far it is from the destination, and where to find even it if it is stolen.

Figure6. GPS in Cargo

10.5. Child Tracking

Of topical interest at this time is 'child tracking', giving the possibility for children to wear or carry some sort of GPS/GSM tracker. Such a device could provide valuable information if a child is abducted or lost. Signals could be sent from the tracker every few minutes to a central site so that a record is kept of the child's loca tion, or just sent when a 'panic button' was pressed by the child.



"12. BIBLIOGRAPHY"

1.www.calccit.org.itsdecision/serv_and_te ch/Automatic_v ehicle_location/automatic_vehicle_location_summary.html

2.http://www.gpsworld.com/gpsworld/article/articleDetail.j sp?id=102387