ISSN 2277-2685
IJESR/Oct. 2015/ Vol-5/Issue-10/1272-1278
Amalapurapu Srinag *et.al.*,/ International Journal of Engineering & Science Research

AUTOMATIC VEHICLE LOCATION DC-DC CONVERTER FOR HYBRID ELECTRIC VEHICLE IN RFID

Amalapurapu Srinag*[1], K.Mallikarjuna Rao[2]

[1]Asst. Prof, Dept. of ECE, KKR & KSR Institute of Technology and Science, Vinjanampadu, Guntur (A.P), India.

[2]Asst. Prof, Dept. of ECE, KKR & KSR Institute of Technology and Science, Vinjanampadu, Guntur (A.P), India.

ABSTRACT

This paper presents a new approach for development of an Automatic Vehicle Identification System (AVIS). The proposed system can be divided into three major modules; they are vehicle image preprocessing, license plate feature extraction and classification algorithm based on Hidden Markov Model (HMM). Experiment has been conducted to demonstrate the effectiveness of the proposed system. The proposed system is tested using Nigeria vehicle license plates. Recognition rate of 98% is obtained; the result is superior in comparison with the results obtained from previous systems.

Keywords: GSM, GPS, Vibration Sensor, ARM Controller.

1. INTRODUCTION

Automatic Vehicle Location (AVL) is an advanced method used to track and monitor any remote vehicle equipped with a software unit that receives and transfers signals through GPS satellite. AVL is a combination of Global Positioning System (GPS) and Geographic Information System (GIS) that provides actual geographic real time position of each vehicle. The entire transmission mechanism of AVL setup depends on GPS satellite, a receiver on the vehicle, a radio system and PC based tracking software for dispatch. The radio communication system is generally the same as cellular phone network. The two most common AVL systems are like GPS based and Signpost based.

Fig. 1: Automatic Vehicle Tracking

The Signpost-based AVL system was used earlier but with the development of modern satellites GPS used technology is more used now. For the applications which require real time location information of the vehicle, Automatic Vehicle Location system is used that can transmit the location information in real time. Real time vehicular tracking system incorporates a hardware device installed in the vehicle (In-Vehicle Unit) and a remote Tracking server. The information is transmitted to Tracking server using RFtransmitter if the distance between tracking sever and vehicle to be track is less. Tracking server also has RF receiver that receives vehicle location information and stores this information in database. This paper is divided into main five parts. In the first part we are discussing the main principle of project i.e., GPS &RFID.In the second part the block diagram is

explained.Working of the project is explained in third part with a brief explanation of each block. In the fourth part the last part gives the application and future aspect.

2. RADIO-FREQUENCYIDENTIFICATION (RFID)

RFID is a technology that uses communication through the use of radio waves to transfer data between a reader and an electronic tag attached to an object for the purpose of identification and tracking.RFID makes it possible to give each product in a grocery store its own unique identifying number, to provide assets, people, work in process, medical devices etc. all with individual unique identifiers - like the license plate on a car but for every item in the world. This is a vast improvement over paper and pencil tracking or bar code tracking that has been used since the 1970s.Furthermore, passive RFID tags (those without a battery) can be read if passed within close enough proximity to an RFID reader. It is not necessary to "show" the tag to the reader device, as with a bar code. In other words it does not require line of sight to "see" an RFID tag, the tag can be read inside a case, carton, box or other container, and unlike barcodes RFID tags can be read hundreds at a time. Bar codes can only read one at a time. Some RFID tags can be read from several meters away and beyond the line of sight of the reader. The application of bulk reading enables an almost-parallel reading of tags. Radio-frequency identification involves the hardware known as interrogators (also known as readers),and tags (also known as labels), as well as RFID software or RFID middleware. Most RFID tags contain at least two parts:one is an integrated circuit for storing and processing information, modulating and demodulating.A radio-frequency (RF) signal, and other specialized functions; the other is an antenna for receiving and transmitting the signal [10]. An RFID system is always made up of two components:

1. The transponder, which is located on the object to be identified,

2. The detector or reader, which, depending upon design and the technology used, may be a read or write/read device.A reader typically contains a high frequency module(transmitter and receiver), a control unit and a coupling element to the transponder. In addition, many readers are fitted with an additional interface (RS 232, RS 485, ...) to enable it to forward the data received to another system (PC,robot control system, ...).The transponder, which represents the actual data carrying device of an RFID system, normally consists of a coupling element and an electronic microchip.When the transponder, which does not usually possess its own voltage supply (battery), is not within the response range of a reader it is totally passive. The transponder is only activated when it is within the response range of a reader. The power required to activate the transponder is supplied to the transponder through the coupling unit (contactless) as is the mtiming pulse and data.

3. BLOCK DIAGRAM AND FUNCTION

3.1 Objective

1. Exploring GPS based tracking systems.

2. Developing Automatic Vehicle Location system using GPS for positioning information and GSM/GPRS/RFID for information transmission.

3. Acquisition of vehicle's location information (latitude longitude) after specified time interval.

4. Developing a web based software to display all transmitted information to end user along with displaying location of vehicle on a map.In-vehicle unit is also responsible for transmitting this information to Tracking Server located anywhere in the world. To achieve all these functionalities In-Vehicle unit uses several modules as described below.

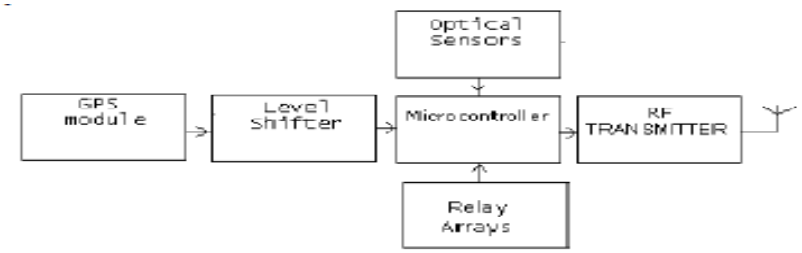


Fig. 2: Transmitter of GPS based Automatic Vehicle Tracking & Controlling Device

3.2 Function of Transmitter

Fig. 2 shows the block diagram of transmitter section. Vehicle tracking systems are electronic devices installed in vehicles for tracking the exact location of the vehicle with the help of Global Positioning System (GSM). The mechanism of the AVL depends on satellite, radio system, GPS unit of the vehicle and a communication center that helps in the information management between dispatch station and customer or passenger.

Micro controller

As the name indicates this unit has the over all command of all blocks or this unit decides when to use & which unit has to be used. Since it is a programmable device it provides the facility to update the device without changes in hardware & it also reduces the hardware required to implement the circuit.

Relays Array

The vehicle is moved by motor, which required large current, but the micro controller cannot provide that much current. Hence to control the large currents by the pulses provided by micro controller for motor & this is done by using relays.

R.F. transmitter

For communication radio frequency can be used hence R.F. transmitter is required. Here we use the transmitter transmitting at 315 MHz using the OOK technique.

GPS Satellite

This locates the vehicle by sending satellite signals to the GPS modem of attached in the vehicle.

Vehicle GPS Unit

The GPS unit of the vehicle receives signals from the satellite, determines the geographic location or co-ordinates of the place and then transmits them to a radio station.

Radio System

It receives the vehicle's geo location coordinates via radio signals and transmits them to the principal communication center via radio signals.

Principal communication center

Collects the data from radio system and converts the vehicle information by using Internet or some specialized software. Then it sends the vehicle information to other information management stations including fleet management center and customer assistance and schedule management center.

3.3 Function of GPS Receiver

Fig. 5 shows the block diagram of Receiver section. In-Vehicle unit uses GPS receiver to capture the current location. Location provided by GPS is not in human understandable format. This raw data needs to be processed to convert it into useful information that can be displayed by a beacon on the map. CPU is required to process this raw data.SiRF Star III single-chip GPS receiver can be used which comes integrated with GM862-

GPS which is GSM/GPRS modem used for data transmission. GPS receiver can also provide information of altitude, time of GPS fix, status of GPS fix, and number of satellite used to compute current location information along with location. GPS fix means last reported location. For tracking purpose only location data is required for transmission. Other data provided by GPS receiver is used to determine the validity of location information.

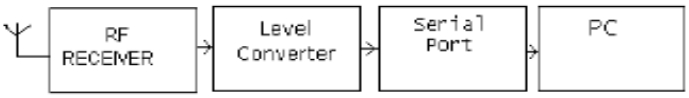


Fig. 3: Receiver of GPS based Automatic Vehicle Tracking & Controlling Device

Level Converter

Serial port of pc can be used, which follows the RS232 standard hence we use a Level Converter. The first level converter converts the TTL signals in to RS232 signals & second level converter converts the RS232 signals to TTL signals.

PC Port

This is the part of unit through which unit interacts with PC, serial port is used for this purpose because we get serial data at the output of the level converter also because this port is TTL compatible.

R.F. receiver

It receives the R.F. signals& receiver is tuned to demodulate the 315MHz signals.

Central Processing Unit

The raw data provided by the GPS receiver is captured by the CPU and processed to extract the required location. CPU is also responsible for monitoring the obstacle comes in the path of vehicle. CPU holds all the required information that is to be transmitted to remote server (i.e, RF Receiver). It also controls data transmission module to exchange information with remote server. It actually acts as a bridge between GPS receiver, vehicle and remote server. It receives commands sent by server through data transmission/receiving module and performs corresponding action required by server. As the processing required in the In-vehicle unit is not computationally intensive therefore any low end microcontroller can be used as a CPU. The microcontroller selected to serve as CPU for In-vehicle unit is Microchip's PIC18F248. This is 8-bit microcontroller and runs at speed of 20 MHz which is enough speed for the system.

Data Transceiver

When all required information is extracted and processed, it needs to be transmitted to a remote Tracking Server which will be able to display this information to the end user. For real time tracking of vehicle, reliable data transmission to remote server is very important.Wireless network is required to transmit vehicle information to remote server. Existing GSM or RFID network is selected to transmit vehicle information to remote server. Mostly GSM is used because of broad coverage of GSM network. It is also cost effective rather than to deploy own network for transmission of vehicle information. For data transmission over GSM network GSM modem is required. GSM modem can send and receive data SMS text messages and GPRS data over GSM network.GM862-GPS GSM/GPRS modem is selected to transmit data over GSM network because of its features and capabilities. GM862-GPS provides AT commands interface i.e. all functions can be accessed by use of AT commands. AT commands can be sent to it using serial interface. It has built in UART that accepts the AT commands and modem performs the function as required by AT command received.

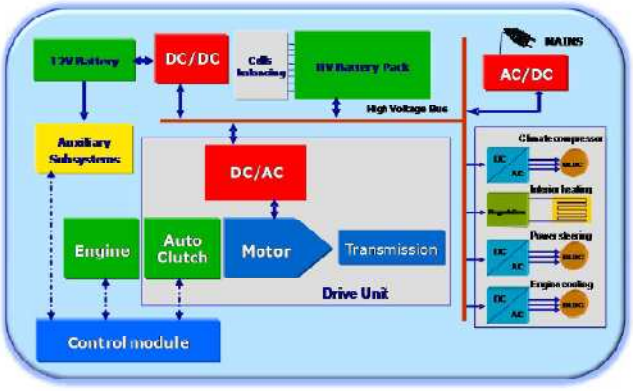


Fig. 4: Hybrid power train block diagram

In this schematic, 12 V is the standard voltage for instrumentation, actuators, and lighting, and is provided by the service battery. A 200-800 V DC link is used for the traction system. A DC/AC (Traction Inverter Module) converter is also used for traction and designed for tens or hundreds of kilowatts, while the DC/DC auxiliary power converter is designed for hundreds or thousands of watts. The traction battery can be charged by the hybrid system control and/or the AC/DC converter from the Mains, while the 12V battery is charged from the traction battery via the DC/DC converter. In some cases, it might be necessary to charge the service battery from the traction battery of fig. 1 via the DC/DC converter. Because of the above considerations, the electric vehicle configuration may need a bidirectional or unidirectional system. The reliability of this converter is also a key point since a fault would lead to discharge of the 12V battery and, consequently, to the loss of all the powered accessories. On the other hand, efficiency and EMC problems cannot be neglected. As a consequence soft-switching and energy recovery techniques such as active clamping are very helpful.Key features of the proposed DC/DC converter are the following:

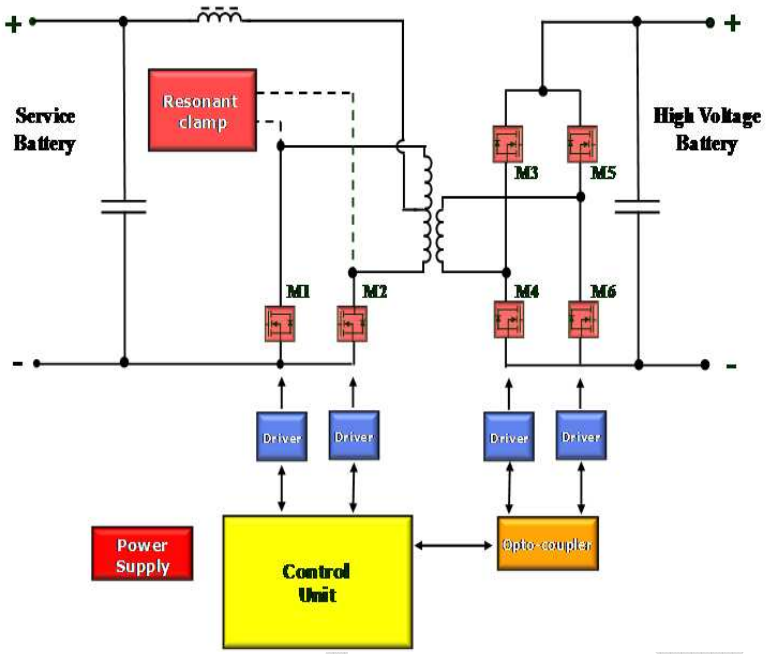
 The nominal voltage at the low voltage side of one input is 12 V and can vary from 8 to16 V during charging and discharging.

 The nominal high-side voltage is 288 V, with an operating range from 255–425V.

 Nominal charging and discharging power is 1.5 kW.

 Switching frequency is 70 kHz.

 Galvanic isolation between the high voltage side and low voltage side is necessary for safety reasons. A high frequency transformer is then used.The schematic of the converter [3] is shown in fig. 2. It consists of one full bridge M3-M6 connected through a high frequency transformer to a push-pull stage with a boost inductor. In the boost mode operation, devices M1 and M2 are controlled with two PWM signals having duty cycles greater than 0.5 and 180° phase shifted from each other.High voltage spikes that are generally observed across the main power devices because of transformer leakage inductance are clamped by a resonant clamp circuit. The energy stored in the clamp capacitor during the device's turn off is then diverted to the main power circuit with considerable energy savings with respect to a conventional dissipative snubber.



In the buck mode operation, the high voltage bridge legs are controlled by means of phase shift modulation. In this way it is possible to achieve Zero Voltage Switching operation (ZVS) in a load range depending on the value of transformer leakage inductance and the device's output capacitance. In fig. 5, the final prototype of 1.5kW DC-DC converter is shown.

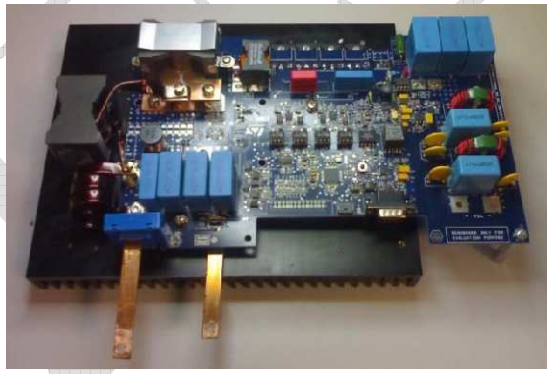


Fig. 5: 1.5kW DC-DC converter

4. APPLICATION S

These days, growing thefts and malicious activities of vehicles are causing losses of billions across the world.Therefore, installing RFID in both commercial as well as private vehicles is the need of hour.Currently In-Vehicle unit

was implemented with two boards. Microcontroller board was externally connected to GM862-RFID interface board. Single board can be designed to incorporate Microcontroller circuitry on the GM862-GPS interface board. It will reduce the overall size of In-Vehicle unit and it will also reduce the number of components so will the cost.

1. After installing a vehicle tracking device in an automobile, a person may easily locate the exact position of that vehicle along with its speed and mileage. Vehicle tracking device also helps the cops in finding stolen vehicles. Certain advanced vehicle tracking devices even deactivate the engine of the vehicle, thus disabling the vehicle from moving.

2. Moreover, parents may always monitor their kids on their journey, thus alerting the driver, that he or she is being watched. Therefore, considering all the safety aspects, a RFID auto tracking device is a necessity in almost every vehicle.

Advantages

The adaptation of AVL system brought a big difference in the productivity of almost all sectors.

1. Increase in productivity - Knowing the precise location of any vehicle help in the better management and that in turn makes positive financial impact on the organization. Better schedule or planning increases the average vehicle trips per day thereby saving capital and labor cost.

2. Information & Communication – Quality communication or information transformation helps in effective supervising in managing schedules of the vehicles. This in other word improves the level of service provided. Again effective information management leads to higher profits through better fleet management. This also helps in providing timely information to customers or passengers.

Advance vehicle arrival time allows travelers to make better travel scheduling and planning.

3. Safety and Security – Quick location of vehicle allows faster security response both for travelers and driver.

Also better information helps in quick response to accidents, weather, road condition and other vehicle related problems.

5. CONCLUSION

Automatic Vehicle Location (AVL) is an advanced method used to track and monitor any remote vehicle equipped with a software unit that receives and transfers signals through GPS satellite. The results presented in this paper contain execution of Startup routine, Logs of Tracking Server and Pointing out current location of vehicle. For vehicle tracking in real time, in-vehicle unit and a tracking server is used. If the distance between vehicle and tracking server is less than RFID can be used.

REFERENCES

[1] French GT. Understanding the GPS. 1st Edition.Bethesda, GeoResearch Inc, 1996.

[2] Tsui JB. Fundamentals of Global Positioning System Receivers. 1st Edition. John Willey & Sons Inc. GPS Images, 2000.

[3] Parsad R, Ruggieri M. Applied Satellite Navigation Using GPS, GALILEO, and Augmentation Systems. London, Artech House, 2005.

[4] Steel R. et al. GSM, cdmaOne and 3G Systems.Chichester, John Willey & Sons Inc, 2001.

[5] Halonen T. et al. GSM, GPRS and EDGE Performance.2nd Edition. Chichester, John Willey & Sons Ltd, 2003.

[6] GPRS (General Packet Radio Service), HSCSD & EDGE.http://www.mobile-phones-uk.org.uk/gprs.html.

[7] Telit Wireless Solutions (2008) GM862-GPS Modem.Microchip (2007) PIC18FXX8 Datasheet.

[8] Transportation District's Automatic Vehicle Location System [online:] http://www.itsdocs.fhwa.dot.gov/research.html.

[9] Vehicle Tracking Systems Overview [Online:] http://www.roseindia.net/technology/gps/automatic-vehicle-location.shtml.

[10] Elit Wireless Solutions (2007) GM862-GPS Hardware user guide. 1vv0300728 Rev. 8 - 20/09/07 World Academy of Science Engineering and Technology 61 2010 99.

[11] RFID-http://www.rfid-handbook.de/rfid/

