

DESIGN AND IMPLEMENTATION OF VEHICLE TRACKING AND MONITORING SYSTEM USING GPS AND ARM PROCESSOR

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Abstract— GPS –Global Positioning System based vehicle tracking and monitoring system contains GPS and GSM module with temperature sensor, accelerometer, and alcohol detector sensor, camera. This proposed system principally monitors the vehicle speed, position (longitude, latitude) and internal parameter such as temperature and alcohol identification, vehicle collision, camera used to view the rear side of the vehicle environment for driver to drive. The innovation of vehicle tracking and monitoring system is implemented in so many ways. Also the proposed system is an economical easily operable. Also the proposed system is an economical and easily operable. Due to these intelligent characteristics it become a vehicle internal parameter monitoring and people friendly. The prototype has been extensively developed and tested in real time scenarios also the results are appreciable.

Keywords— Global Positing System, Global Monitoring System, ARM Processor, temperature sensor, accelerometer, Camera, Liquid Crystal Display, Data base, Real Time operating System.

I. INTRODUCTION

The design and development of a vehicle tracking and monitoring system especially useful for mining appliances in real-time has been reported in this paper. The system principally monitors vehicle moving and tracking appliances such as position, and speed and subsequently identifies alcohol detection. The novelty of this system is the implementation of vehicles internal and external parameter in different ways. The developed system is a low-cost and flexible in operation like mines and thus can avoid collision and traffic jam. The prototype has been extensively tested in real-life situations and experimental results are very encouraging for drivers and proprietors.

A lot of vehicle theft occur and accident due to over speed, alcohol drunken by driver. GPS is increasingly being used in vehicle tracking and monitoring services. To resolve the problems like avoid speed and collision, traffic jams ARM processor based vehicle monitoring is implemented as well providing information for the vehicle owner.

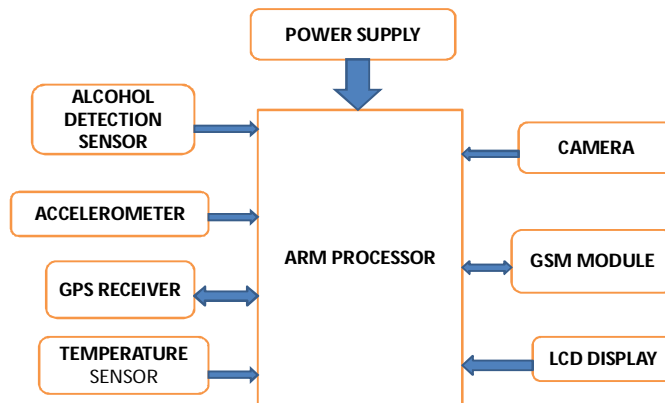
II. SYSTEM DESCRIPTION

The system has been designed for ARM processor vehicle tracking and monitoring will provide effective and real time vehicle location using GPS and GSM. A GPS based vehicle tracking will inform where you vehicle is and where it has been and how long it has been. The system uses geographic positions and time information from the global Positioning Satellites. The system has on board which resides in the vehicle to be tracked and a Base Station that monitor data from the various vehicles. This project ability is accurately detected the vehicle and monitoring the speed for avoiding collisions. Fig 1. Shows the entire vehicle tracking module. Design provides public many conveniences in life but also bring many problems at the same time, for example traffic congestion, difficulty in monitor dispersive vehicle, theft and other series of problem [2].

The details of the design and development of the tracking modules are provided in the following sections. The output signals from the temperature sensors are integrated with ARM processor. Accelerometer is connected with processor for providing analog signals. This is used to measure the acceleration. It's sensing the earth gravity and acceleration. The output of the accelerometer provides 1.70V to 3.5V in positive direction and negative direction voltage in the drop from 1.65V to 0V output of accelerometer is analogue form with three different output voltages. These three voltage signals are processed through ADC on three different channels available on ARM. The digital output is fed in UART of ARM.

Temperature sensor is interfaced with ARM processor and alcohol sensor also interfaced for identify the detection in inside of the vehicle. The rear camera which is used for measures the displacement and avoids damages in the vehicle and displayed through LCD to driver. The temperature sensor provides temperature per degree Celsius to ARM processor. Vehicle speed ,position, and temperature ,alcohol detection results are stored in SD card .This storage card device is interfaces to an ARM processor using SPI(Serial Peripheral Interface).when accident/collision occur sensed by Accelerometer which connected with ARM processor. SD card data's are accessed by Base Station unit for providing information to the vehicle owner.

Fig 1.provide vehicle module and Fig 2 provide Base station module.



(Fig 1.)



(Fig 2.)

III. WORKING METHODOLOGY

Vehicle tracking unit:

- 1) *Vehicle position:* Global Positioning System (GPS) based satellite navigation provide location and time information in 0all weather conditions. Vehicle position is tracked by using Mediatek MT3329.this GPS module support up to 10 Hz update rate. This module will communicate to ARM processor for to send the information through GSM module at the Base Station unit and all the received data stored using Microsoft visual studio 2010. GPS receiver unit HOLUX GR-67 series is contains SiRF chipset, 20 channel receiver type accuracy position up to 10 meters. Its required power in the range of 3.3V to 5.5V for operation.

A GPS receiver must be locked on to the signal of at least three satellites for latitude and longitude of the vehicle. With four or more satellite in sight, the receiver can determine 3D position (latitude, longitude, altitude).This information is check on the Hyper Terminal of a computer using USB to Serial converter. Its the control centre for dynamic management of vehicle that provide a set of functions to analyse where resources are being used. High integration of density of water proof should be used for this design.

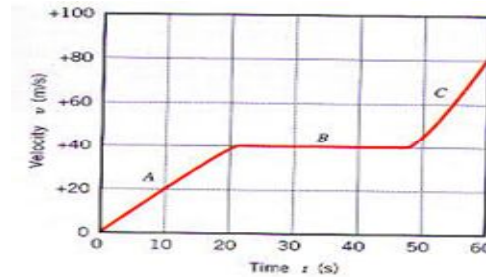


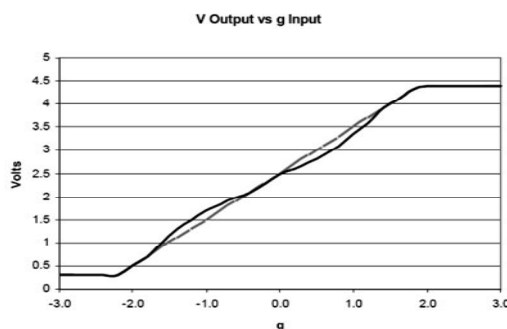
Fig 3. velocity v Vs time t characteristics

- 2) *GSM module*: For The GSM modem is a specialized type of modem which accepts a SIM card operates on subscriber mobile number over a network, just like a cellular phone .It's a cell phone without display. Modem SIM 300 is a triband GSM/GPRS engine that works on EGSM900MHz, DCS1800Mhz and PCI1900mHz frequencies.GSM modem is UART compatible, i.e. it takes -3V to -15V as logic high and +3V to +15V as logic is low. In future we can use this module Shot Message Services (SMS) also and its used by more than over 1.5 billion people [1].
- 3) *ARM Cortex M3 processor*: Its contain Reduced Instruction Set Computer (RISC) and instruction set is relevant to decode mechanism are much simpler then micro programmed complex instruction set computers. This simplicity is result a high instruction through put and impressive real time interrupt response from small and cost effective core. The STM32F405RG which is based on 32 bit ARZ cortex M4 based architecture supporting real time simulation. When ARM processor combined with RTOS timing constraint can be realized for the data acquisition. All the information is stored SD card through ARM processor like vehicle type location, speed, temperature for base station access.

Accelerometer: In order to find out collision or motion between vehicles accelerometer connected with ARM processor. Accelerometer attached to the vehicle is what triggers airbag deployment. These accelerometers are physically mounted to the chassis of the vehicle and experience every force of the vehicle experience.

$$\int a dt = v+v_0$$

Where a is Acceleration and V indicates velocity, v₀ tends to initial velocity



Crash zone testing installations typically incorporate a crash test sensor that designed for use in areas of a vehicle which deforms under high shock inputs, thus requiring sensor that is not intended to reuse. To satisfy the application requirement sensor must be rugged enough to withstand a high impact event sensitive enough to trigger vehicle passive restraint system. To meet this challenging requirements meggit sensing model 7286 required.

1) *Temperature sensor*: CKPT 45 module(suitable for mining applications) is useful to find out the vehicle engine speed, outdoor temperature ,indoor temperature, oil flow level etc.GPS tracking device CKPT 45 connected to the CAN bus that allows to get the vehicle operating parameters directly. It's also possible to carry out real time diagnostics of engine failure. All the parameters are received by ARM processors and passed to base station unit.Alcohol Gas sensor MQ3 will detect alcohol drunken and information passed through the processor.

2) *Display solutions for to prevent accidents* : The rear view camera systems is useful for displaying object placed on backside vehicle to avoid vehicle damage and real time display to driver through LCD panel on the indoor vehicle unit. Rear visioning system contains CCTV camera for heavy duty vehicle application .cameras can e fitted into machine to maximize the operator spatial awareness to the operator on LCD monitor screen. The output from the cameras are connected with ARM processor and displayed through LCD.

3) *Base station unit*: The rear view whatever the data stored in SD card is accessed by base station unit an Storing this information using Microsoft visual studio 2010.SD card contains position (latitude, longitude),speed, date ,time, vehicle number and all. The location is displayed on the GUI (Graphics User Interface) and stored in a data base. In case of accident can occur position vehicle can be easily through navigation softwares. Exception handling provides a structure and extensible approach to error detection and recovery. Microsoft C# compiler for the .NET framework a conforming implementation of both the standards.

IV. REAL TIME RESULTS

The prototype is in operation in a trial on mining and others places with various heavy duty vehicles regularly used by an for trucking purpose. The following parameters were tested: vehicle speed, position(latitude, longitude), temperature on the indoor unit, toasters, and alcohol detection In total, different heavy duty vehicles were used in the experimental setup; however, the implementation of vehicle tracking and monitoring system is working well and position of vehicle is accuracy also high.

V. CONCLUSION

Design and Implementation of vehicle tracking and monitoring using GPS and ARM processors to avoid vehicle collision and reduce traffic jams on the road at the same time speed of the vehicle also monitored. The developed system effectively monitors and vehicle moving and indoor parameters of vehicle unit like temperature, alcohol detection. The system can be extended for monitoring the whole parameters like engine oil, fuel range, speed, temperature, oil in tank. The monitoring systems are programmed with various module interfaces suitable for users of varying ability and for expert users such that the system can be maintained easily and interacted with very simply. This system is useful in much application such as surveillance, security tracking, which may be installed in mining trucks, cargo trucks, cars, motorcycle, and robot. The system can be useful for many applications.

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