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Intelligent Accidental Detection and Prevention System for Car using Can FD Protocol

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Abstract: *Controller Area Network with Flexible Data Rate (CAN FD) is a vehicle bus standard protocol designed especially for automotive application. By using CAN FD Bus protocol, ECUs (Electronic control units) of vehicles can communicate with each other. It is a high speed, bandwidth efficient network. In order to reduce point to point wiring harness in vehicle automation, CAN FD is suggested as a means for data communication within the vehicle environment. The benefits of CAN FD bus based network over traditional point to point schemes will offer increased flexibility and expandability for future technology insertions units. We have designed five nodes, 4-sensor nodes and 1-Bus monitor nodes. Sensor nodes and Bus monitor nodes are communicating with each other through CAN FD Bus. Bus monitor node collects all messages present on the CAN FD Bus and transmits to the PC by using the UART interface. The CAN FD monitor window is designed using Visual Studio.net which allows the time oriented buffering of CAN FD messages and visualization of the BUS data at the package level.*

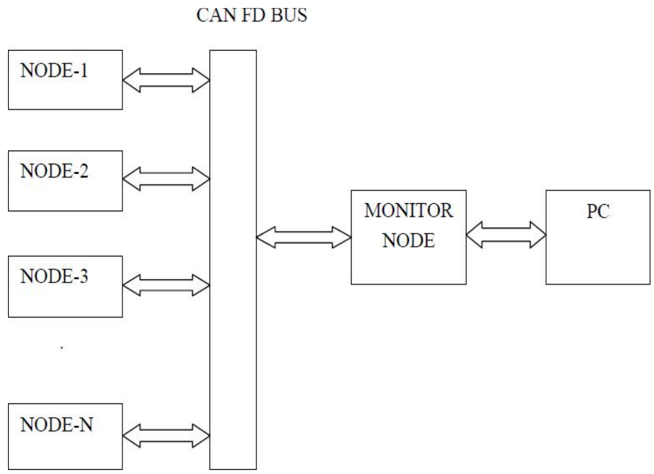
Keywords: Intelligent Accidental Detection

I. INTRODUCTION

The goal of the thesis is to design and implement CAN FD bus prototype for vehicle automation. CAN FD means Controller Area Network with Flexible Data Rate. It is a standard vehicle bus which is designed to permit microcontrollers and devices to converse with each other inside a vehicle. CAN FD is a message based protocol, designed especially for automotive purposes but now also applied in other locales such as industrial mechanization and medicinal apparatus. We mainly have focal points on hardware and software design of intellectual nodes. Hardware interface circuit consists of MCP2517 stand alone CAN FD Controller with SPI interface, LPC2148 microcontroller based on 32-bit ARM7TDMI-S CPU and ATA6563 high rated CAN Transceiver. The MCP2517 is the earliest exterior CAN FD controller of industry. The device permits existing systems the simple way to apply CAN FD exclusive of major design modifications. External controller used here increases the choice of MCUs to fit best in the application—CAN FD is a latest protocol and there are hardly any choices for MCUs with CAN FD, mainly with temperature rating of -40°C to 150°C. By using the MCP2517 you can easily add extra CAN FD channels, as in lots of cases application require additional CAN FD channel than are existing on MCU. The MCP2517 is high rate CAN FD transceiver which has two operating modes i.e. Standby and Normal. It is capable of being directly interfaced to microcontrollers with power supply starting at 3V to 5V with the speed up to 5 Mbit/s. ATA6563 CAN Transceiver is fully ISO 11898-2,-5, SAE J2284 compliant. The first automotive Grade 1 and 0 qualified CAN/CAN FD transceiver family with an ambient temperature ranking from -40° to 125°C/150°C of the industry is built by the ATA6562, ATA6563, ATA6564, ATA6565 and ATA6566. The software design for CAN FD bus network system is mainly the design software of CAN FD nodes, communicating with each other. The intention of the software communication part consists of system initialization and CAN FD controller initialization part, message sending part, message receiving part and the interrupt service part

II. BLOCK DIAGRAM

The block diagram for CAN FD bus communication system is as depicted in figure 4.1. Various nodes are not anything other than ECUs of vehicle systems, which are associated to every one further with CAN FD bus. For enhancing the performance of vehicle systems, ECUs are commune with every one further by using common resources such as CAN FD bus, based on CAN FD bus protocol. Monitor node examines data on the bus and gives it to the PC for more investigation. Visual Studio.net software is utilized for compilation of data, investigation as well as error diagnosis of the system.



Detailed block diagram of CAN FD bus prototype for vehicle automation is as depicted in figure 4.2. Each node is made of host microcontroller, CAN FD controller MCP2517 and CAN FD transceiver ATA6563.

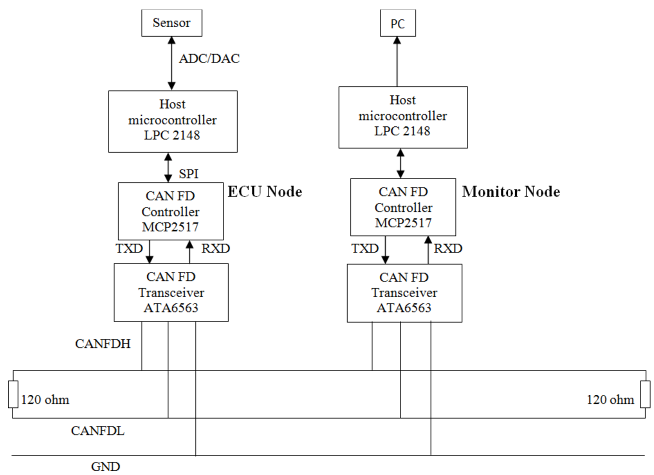


Figure: Detailed Block Diagram CAN FD Bus System

III. SOTWARE USED

3.1 Keilμvision

Keilμvision is a serial console; it provides an Integrated Development Environment (IDE) for microprocessors. It is a free and open-resource terminal emulator and network file transmit application. Keil compiler is software utilized where the machine language code is written and compiled. By translating high level language source code to object code, i.e. the machine source code is transformed into hex code, after compilation which helps in different embedded applications. It has a project manager, simulator, and debugger, cross compiler, assembler, and linker. It supports users for easy program execution for the systems. The Keilμvision software is intended to resolve the troubles facing embedded software developers. In this system we have used Keilμvision software to write the code of the system which helps to quickly and successfully develop embedded applications and is easy to use and is guaranteed to assist you reach your design goals.

3.2 CANoe

Software tool known as CANoe is developed by Vector. For improvement, examination and investigation of whole ECU networks and individual ECUs, CANoe is the inclusive software tool. From planning up to final system-level tests, it supports you during the complete improvement procedure. We can imitate the complete network bus and we can imitate all the nodes on this bus, by utilizing this tool basically. All kinds of communication protocols are supported by those utilized in the automotive industry.

Embedded C is generally an expansion of the C language, they are more or less similar. Such as fixed point kinds, several memory areas, and I/O register mapping, Embedded C comprises additional features above C. Embedded C utilizes the majority of the syntax and semantics of standard C, e.g., main() function, variable definition, data type declaration, conditional statements (if, switch case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, etc. By means of the binary machine codes which the processor utilizes to code the instructions, assembly language maps mnemonic words. For programming embedded devices, Assembly language appears to be a clear choice.

3.3 Flash Magic

For programming flash based microcontrollers from NXP utilizing a sequential or Ethernet protocol, Flash Magic is a PC tool even as in the objective hardware.

3.4 Proteus 8 Professional

Proteus is a software suite consisting of schematic, simulation as well as PCB designing. Proteus (PROcessor for TExt Easy to USe) is a completely functional, procedural programming language. Proteus includes lots of functions resulting from a number additional languages: C, BASIC, Assembly, Clipper/dBase; it is particularly versatile in dealing with strings, having hundreds of devoted functions; this makes it one of the richest languages for text manipulation.

Transforming information from one form to another is the main usage of this language. Proteus was primarily formed as a multiplatform (DOS, Windows, Unix) system usefulness, to influence text and binary files and to create CGI scripts. Most of these extra functions just exist in the Windows flavor of the interpreter. Proteus was intended to be realistic (easy to use, efficient, complete), understandable and constant.

Its strongest points are:

- Powerful string exploitation;
- Unambiguousness of Proteus scripts;
- Accessibility of advanced data structures: arrays, queues (single or double), stacks, bit maps, sets, AVL trees.
- The language can be expanded by adding up user functions written in Proteus or DLLs created in C/C++.

3.5 Dip-trace

Dip-trace is software which is used for designing PCB layout. Dip Trace is an EDA/CAD software for creating schematic diagrams and printed circuit boards. Advanced circuit design instrument with support of multi- sheet and multi-level hierarchical schematics that distributes numerous features for visual and logical pin connections. Cross-module supervision guarantees that major circuits can be simply transformed into a PCB, back- annotated, or imported/exported from/to other EDA software, CAD formats and net-lists. DipTrace Schematic has ERC authentication and Spice export for exterior reproduction. Engineering device for panel intend with smart manual routing, differential pairs, length-matching tools, shape-based auto router, advanced verification, layer stackup manager, and wide import/export capabilities.

3.6 Visual Studio.net

Visual Studio.net is used to develop graphical user interfaces. Visual Studio.net programs are primarily event driven. CAN FD monitor window permits the visualization of the bus data with the help of Visual Studio.net.

3.7 CAN FD Analyser

CAN FD Analyser collects CAN FD messages and allows time oriented buffering of messages even when dealing with very high bus loads and baud rates [15].

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IV. HARDWARE DESIGN

4.1 Node Design

The devices that are linked by a CAN FD network are normally sensors, actuators, and other controlling devices. These devices are linked to the bus with the help of a host processor and a CAN controller.

Block diagram for individual nodes is as shown in following figure 4.3. Block diagram shows the microcontroller and CAN FD controller MCP2517 corresponding among each other by means of SPI protocol. Individual nodes consist of host processor, CAN FD controller and CAN FD transceiver. Individual nodes are connected to the CAN FD bus line. CAN bus is ended on both ends by using 120 ohm resistor.

4.1.1 Host Processor

The host processor makes a decision what received messages indicate and which messages it desires to pass on itself. The host processor can connect sensors, actuators and control devices.

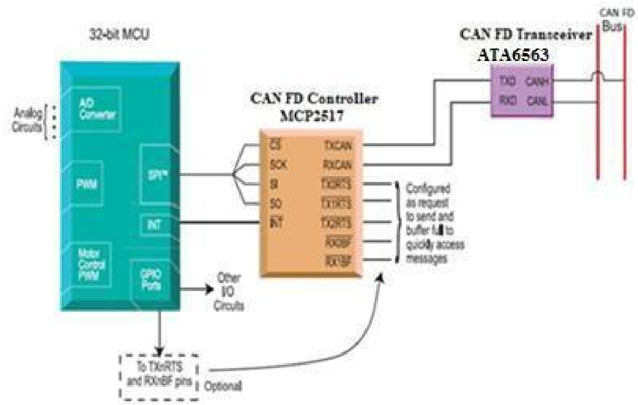


Figure: Block Diagram of node of CAN FD Bus System

4.1.2 CAN FD controller:

The CAN FD controller stores accepted bits successively from the bus till a complete message is available, that can then be obtained by means of the host processor The host processor stores and it passes on messages towards a CAN FD controller, which broadcasts the bits successively on the bus.

4.1.3 Transceiver (possibly integrated into the CAN FD Controller)

It adjusts signal stages from the bus to stages that the CAN FD controller is expecting and has defensive circuitry that defends the CAN FD controller. It changes the transmit-bit signal accepted from the CAN FD controller into a signal that is sent on the bus.

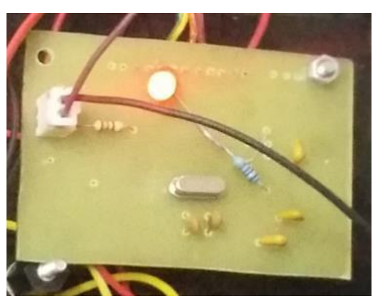
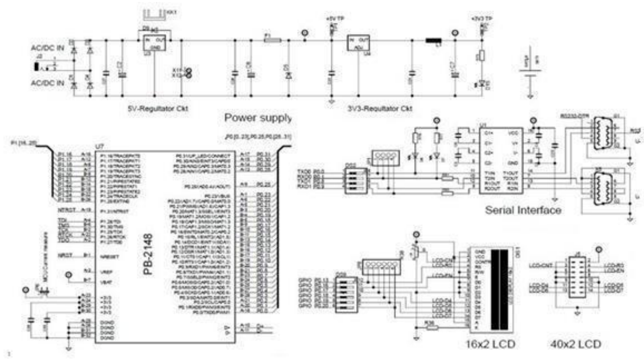


Figure: Hardware module of CAN FD Controller and CAN FD Transceiver CAN FD Bus System.

4.2. Circuit Diagram

Circuit diagram of individual modules is as depicted in figure 4.6. Circuit diagram shows the circuit details of the pin connection of LPC2148, CAN FD controller and CAN FD transceiver circuit, power supply circuit, reset circuit, LCD interfacing and relay interfacing circuit etc. The MCP2517 interfaced by means of microcontroller (LPC2148) through an industry standard Serial Peripheral Interface (SPI). TxCAN and RxCAN pins of the connected TxD and RxD pins of the ATA6563 respectively. CANH and CANL pins of ATA6563 are connected to the CAN FD bus. MCP2517 are connected TxD and RxD pins of the ATA6563 respectively. CANH and CANL pins of ATA6563 are connected to the CAN FD bus.



Microcontroller: LPC2148:

LPC2148 is a 32 Bit ARM7 TDMI-S MCU from Philips (NXP). It contains 512KB Flash Memory and 40KB static RAM. It uses 12.00MHz Crystal, so MCU is able to route data by means of the utmost high rate at 60MHz while using it with Phase-Locked Loop (PLL) inside MCU. It has RTC Circuit (Real Time Clock) with 32.768 KHz crystal and Battery Backup. It supports In-System Programming (ISP) and In-Application Programming (IAP) via On-Chip Boot-Loader Software throughout Port UART-0 (RS232) [12].

SPI Protocol:

MCP2517 is a Stand-Alone CAN FD Controller among SPI Interfaces. The MCP2517 interfaced by means of microcontroller (LPC2148) using an industry standard Serial Peripheral Interface (SPI).

SPI is a full duplex serial interface. It is able to hold numerous masters and slaves which are joined to a specified bus. After the interface through a given information transmission just a particular master and a particular slave can communicate. The master constantly passes on 8 to 16 bits of data to the slave, and the slave constantly passes on a byte of data to the master through a information transmission. 4 pins SCK0, SSL0, MISO and MOSI0 of LPC2148 are utilized for SPI interface. SCK0 is an input/output SPI clock signal utilized to harmonize the transmission of information diagonally to the SPI interface. SSEL0 is input SPI slave select signal is an active low signal that specifies that slave is presently chosen to contribute in a information transmission. MISO0 is input/output Master In Slave Out signal. Serial information from the slave to the master is transferred by the MISO signal which is a unidirectional signal. MOSI0 input/output Master Out Slave In signal. Sequential data from the slave to the master is transferred by the MOSI signal which is a unidirectional signal. The SPI encloses 5 registers [12].

1. S0SPCR: The process of the SPI is reined by the SPI Control Register.
2. S0SPSR: The condition of the SPI is shown by the SPI Status Register.
3. S0SPDR: SPI Data Register, this bi-directional register provides broadcasts and accepts data for the SPI.
4. S0SPCCR: SPI Clock Counter Register, this register manages the frequency of a master's SCK0.
5. S0 SPRINT: SPI Interrupt Flag, this register encloses the interrupt flag for the SPI interface.

Master Operation

Once it is set up to be the master, the subsequent chain depicts an information transmission with the SPI block [12].

1. Put the SPI clock counter register to the preferred clock rate.
2. Put the SPI control register to the preferred settings.
3. To broadcast to the SPI data register, write the data. Writing this data starts the SPI data transfer.
4. Wait for the SPIF bit to be located to 1 in the SPI status register. The SPIF bit will be located once the final phase of the SPI data transfer; the SPIF bit will be set.
5. Interpret the SPI status register.

6. Interpret the conventional data from the SPI data register (optional).
7. If more data is necessary to transmit; go to step 3.

Slave Operation

The subsequent order illustrates how one should route a data transmission by means of the SPI block once it is located up to be a slave. It is necessary that the system clock which drives the SPI logic be at least 8X quicker than the SPI [12].

1. Put the SPI control register to the preferred settings.
2. Write down the data to be broadcasted to the SPI data register (optional). Note down that this can simply be done once a slave SPI transmission is not in progress.
3. Wait for the SPIF bit to be set to 1 in the SPI status register. The SPIF bit will be set once the final phase of the SPI data transfer; the SPIF bit will be set.
4. Interpret the SPI status register.
5. Interpret the accepted data from the SPI data register (elective).
6. If extra data is necessary to transmit; go to step 2.

4.3. CAN FD Controller

MCP2517:

The MCP2517FD is a CAN FD controller that can be easily inserted to a microcontroller by means of an existing SPI interface. The MCP2517FD supports both, CAN frames in the Classical format (CAN2.0B) and CAN Flexible Data Rate (CAN FD) format, as specified in ISO 11898- 1:2015.It has arbitration Bit Rate upto 1Mbps and Data Bit Rate upto 8 Mbps. CAN FD controllers consist of 2 modes: Mixed CAN 2.0B and CAN FD mode, CAN 2.0 mode [13].It is able to broadcast and accept both ordinary and extensive data and remote frames by means of 0 to 64 byte duration of the data field. The MCP2517 interfaced with a microcontroller (MCU) through an industry standard Serial Peripheral Interface (SPI). MCP2517 CAD FD Controller contains two receive buffers with prioritized message storage and three transmit buffers with prioritization and terminating features. Message transmission and reception is explained as below,

4.3.1. Message Transmission:

Message transmission in CAN FD controller is done according to the prioritization of message i.e. based on priority bit field, and/or the message with lower ID gets broadcasted initially by means of the Transmit Queue(TXQ).

Transmit Priority

The transmit priority of the FIFOs and TXQ needs to be configured using the TXPRIx bits (C1FIFOCONxH<4:0> and C1TXQCONH<4:0>).Before transmitting a message, the priorities of the TXQ and the TX FIFOs queued for transmission are compared. The FIFO/TXQ with the highest priority will be transmitted first. For example, if FIFO 1 has a higher priority setting than FIFO 3, all messages in FIFO 1 will be transmitted first. If multiple FIFOs have the same priority, the FIFO with the highest index is transmitted. For example, if FIFO 1 and FIFO 3 have the same priority setting, all messages in FIFO 3 will be transmitted first. If the TXQ and one or more FIFOs have the same priority, all messages in the TXQ will be transmitted first.

The transmit priority will be recalculated after every successful transmission of a single message.

Transmit Priority of Messages in FIFO:

In this method, the messages in a FIFO are transmitted First-In-First-Out.

Transmit Priority of Messages in TXQ:

Messages in the TXQ are transmitted based on the message ID. The message with the lowest message ID (highest priority) is transmitted first.

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Transmit Priority Based On ID

The goal of transmitting CAN messages based on ID is to avoid "Inner Priority Inversion". If a low-priority message is waiting to get transmitted due to bus traffic (arbitration), a higher priority message could be prevented from being transmitted. The TXQ solves this issue by reprioritizing the messages in the queue based on priority (ID).

Retransmission Attempts

The number of retransmission attempts can be configured as follows:

1. Retransmission attempts are disabled
2. Three retransmission attempts
3. Unlimited retransmissions

The retransmission attempts can be restricted by setting RTXAT (C1 INH<0>). The numerous of retransmission attempts can be configured individually for each transmit FIFO and the TXQ usingTXAT<1:0> (C1FIFOCONxH<6:5> and C1TXQCONH<6:5>,respectively).

In case RTX AT = 0, unlimited retransmission attempts will be used for all transmittingFIFOs and the TXQ, and TXATx will be ignored.

Retransmission Attempts Disabled

TXREQ will be cleared after the attempt to broadcast the message. If the message is not successfully transmitted due to loss of arbitration or due to an error, TXATIF in the C1FIFOSTAx or C1TXQSTA register will be set

Three Retransmission Attempts

In case an error is detected during transmission, the CAN FD Protocol Module will decrease the number of remaining attempts and try to retransmit the message the next time the bus is Idle. In case arbitration is lost, the number of remaining attempts will not change. If all retransmission attempts are exhausted, TXREQ will be cleared and TXATIF in C1FIFOSTAx or C1TXQSTA will be set. Before retransmitting the message, the transmit priority will be recalculated. The retransmission attempts will be reinitialized if a different TX FIFO or TXQ is selected for transmission, or if a message is received after the last transmission attempt.

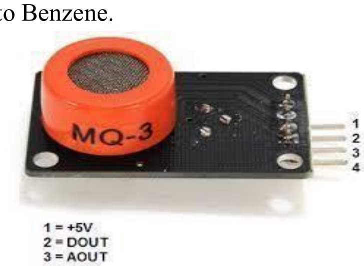
Unlimited Retransmissions

TXREQ will be cleared only after all messages in the TX FIFO or TXQ are successfully transmitted.

Sensors and Modules

Alcohol Sensor (MQ3)

Drunk driving is one of the reasons for vehicle accidents. Hence in this system we use an Alcohol sensor to sense the Alcohol. First LPC2148 interprets the significance of Alcohol concentration which is transforms frequently into the car and subsequent value gets sensed by Gas sensor MQ-3 if any alcohol is sensed in the driver's compartment then it displays the alcohol concentration on LCD and buzzer on to specify oralert the driver to avoid any possibility of accident. MQ3 is an analog gas sensor which is appropriate for identifying alcohol and can be utilized in a Breathalyzer which has a high sensitivity to alcohol and less sensitivity to Benzene.

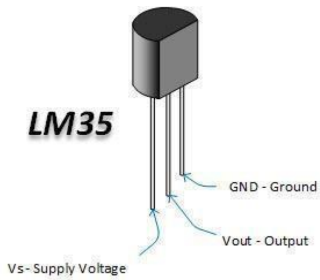


Alcohol Sensor

The sensitivity can be attuned by the potentiometer. SnO2 is a sensitive material of the MQ-3 gas sensor which has minor conductivity in clean air. When the objective alcohol gas exists, the sensor's conductivity is privileged all along by means of the gas concentration increasing, utilizing an easy electric circuit. The MQ-3 gas sensor has high sensitivity to Alcohol, and has superior resistance to perturb the gasoline, smoke and steam. It is inexpensive and appropriate for unlike applications, and might be utilized to sense alcohol by means of diverse concentration.

Temperature sensor (LM35)

On the majority of vehicles, the temperature sensor (TS) can be established somewhere close to the engine that permits it to operate optimally. Overheating is one of the most significant issues in vehicle accidents. In this system we use the LM35 temperature sensor for continuously sense the temperature of engine and using LPC2148 microcontroller it display on LCD and if the temperature is above the normal range then automatically buzzer will on and relay will off and message will display on LCD i.e "temperature is high "to avoid the vehicle from catching fire.



LM35 Temperature Sensor

Pollution sensor (MQ135)

Leakage of gas is one of the most significant issues in vehicle accidents. In this system we use the MQ135 pollution sensor to continuously sense the gas present in the vehicle. LPC2148 microcontroller read the sensor data and display on LCD and if the sensed output is above the normal range then automatically buzzer will on and relay will off and message will display on LCD i.e "dangerous gas is detected " to avoid the burning of vehicle. MQ135 analog sensor which is highly sensitive to ammonia nitrogen, oxygen, alcohols, aromatic compounds, sulfide and smoke generated by vehicles. It has the ability to sense various dangerous gasses.

Pollution Sensor

Vibration sensor (801s)

Vibrations are the top most factor that we can consider or measure in order to sense the accident. In this system we use 801S Vibration Sensor. The 801S shock and vibration sensor once subjected to vibrations changes its resistance by itself. When the vibrations are beyond the typical range, in that case automatically the buzzer will turn on and the relay will turn off and a message will display on LCD i.e "Accident has occurred." It is a high sensitivity 801S Vibration Sensor module and has two output signal pins. When one digital pin (D0) senses some vibration up to a definite threshold, it can output High or Low level. One analog pin (A0), can real-time output voltage signal of the 801S vibration.

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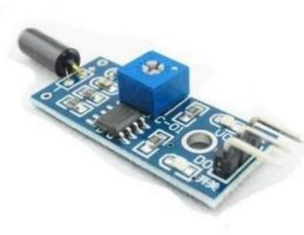


Vibration Sensor

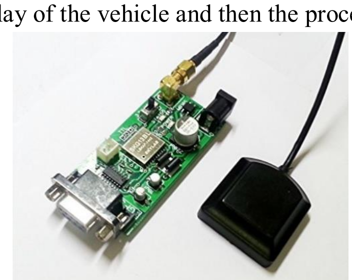
GSM:

In this project the GSM SIM 800C module is utilized for particular purposes to send the messages to the registration number (family number, police, etc.). SIM 800C Module is an absolute Quad-band GSM/GPRS solution in a SMT form, which can be implanted in the consumer applications. These modules are a sub-system of the Internet-of-everything hardware. Quad-band 850/900/1800/1900MHz is supported by SIM800C and can pass on Voice, SMS and data information with low power utilization.

GPS

In this project GPS Module used to track the vehicle continuously. GPS makes it possible to accurately recognize positions on the globe by computing distance from the satellites. GPS permits you to trace or produce positions from places on the earth and assist you navigate to and from those places. The GPS system is a space age navigational system which can locate your place wherever on the globe generally inside a few yards or meters GPS make use of a group of 24 satellites in fixed orbits approximately 12000 miles higher than the earth. The satellites broadcast information by means of high frequency radio waves back to earth. This is navigational system that uses network of 24-32 satellites. The satellites are located in orbits concerning an altitude of 12000 miles from the earth surface .The satellites send microwaves signals which are composed by GPS receiver. GPS unit just measures the travel time of the satellites. Distance =Velocity (speed) *Time. GPS can calculate a latitude & longitude and track movement initially.

The GPS receiver is ready to recee the signal from the GPS satellite. If the GPS receiver receives the vehicle's signal from the GPS satellite, then the latitude and longitude position is known. These latitude and longitude locations of the vehicle will be exhibited on the LCD display of the vehicle and then the procedure gets ended.



GPS Module

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LCD Display

LCD display

In this system we have used a liquid crystal display (LCD) to display the data detected by the sensors, GPS and GSM. A liquid crystal display (LCD) is a slim, flat display gadget. It is prepared up of monochrome pixels grouped in a light supply or by any number of colors. This type of display is utilized in digital watches and handy PC's. LCD displays have sheets of polarizing substance and a liquid crystal solution among them. consists of liquid crystal molecules which are balanced among two transparent electrodes, two polarizing filters and the axis of polarization. The axis of polarity is located vertically to each other. The sheets lacking the liquid crystals create the light passing through one sheet will obstruct the supplementary.

The liquid crystal differs from the light polarization entering one filter and can surpass throughout the supplementary. By controlling the color of light, LCD can display images. An LCD monitor's brightness can be given by means of backlight. Main advantage in LCD‟s is to reduce liquid crystal cell response times [15].Each pixel Alcohol sensor node and Vibration sensor node are communicating with each other through CAN FD Bus. Bus monitor node collects all messages present on the CAN FD Bus and transmits to the PC by using the UART interface. After every 150ms microcontroller samples pin status and creates the message frame and send that message on bus line. When valid message is received, MCP2517 generates interrupt on P0.3 pin of LPC2148. Microcontroller processes the message and act according to the received message.

When the system is initialized then the LCD display present on the Alcohol sensor node indicates the status of the Alcohol sensor. Temperature sensor is linked to the P0.28 pin of LPC2148 and alcohol sensor is linked to the P0.29 and relay and motor are connected at p0.12 whereas vibration sensor is linked to the P0.28 pin of LPC2148 and pollution sensor is linked to the P0.29. When no alcohol is sensed then the relay will be on i.e. high and the motor will start and the system will start working. When the alcohol is sensed then the relay will be off i.e. low and the motor will stop and the system will not initialize or stop working.

Bus monitor node monitors messages available on CAN FD BUS and these messages are sent to the PC. Graphical user interface collects all messages trans-mitted by the bus monitor node. We can connect hardware to the PC by pressing \Connect" button. Once hardware gets connected to the PC, we can start collecting and displaying the messages.

V. RESULTS

In this system various sensors are interfaced to LPC2148 & the output of all Sensor data is exhibited on the LCD display as depicted in figure below. In this system, when sensor output is in normal range then no action takes place & when the sensor output goes above normal range then automatically relay and display will be active and message displayed on LCD and to the preprogrammed number.

Observation Table

Sr.No	Name of Sensor	Normal Range of sensor	Critical range	Action takesplace at critical range
1.	Temperature Sensor	7 Degree Celcius	Greater than 60	Buzzer & Relay will active and Message will display on LCD
2.	Alcohol Sensor	180%	Greater than 180%	Buzzer & Relay will active and Message will display on LCD
3.	Vibration Sensor	100-200	Greater than 200	Buzzer & Relay will active and Message will display on LCD and Message send to owner
4.	Gas Sensor	60%	Greater than 60%	Buzzer & Relay will active and Message will display on LCD

Sensor Details

Fig. Temperature and Alcohol Sensor output observed on the LCD

Fig. GSM output observed on the LCD

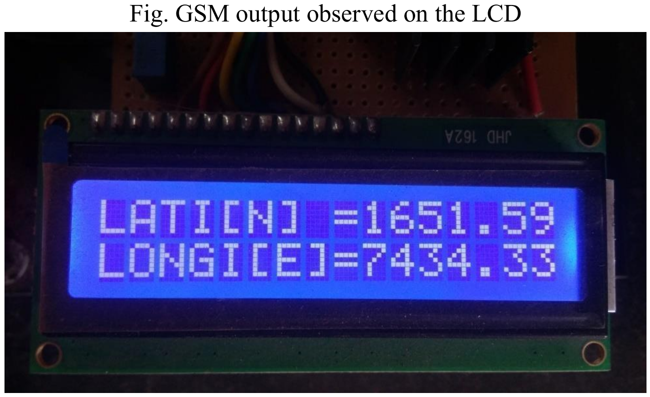

Fig. GPS output observed on the LCD

GPS is used in this system for location tracking & GSM used for message sending as depicted in figure below. In this project GPS and GSM based vehicle tracking system is designed such that the location in the form of latitude and longitude of vehicle is sent to the owner on his cell phone as a short message (SMS) using GPS and GSM modem. This system is also enabled to prevent accidents.

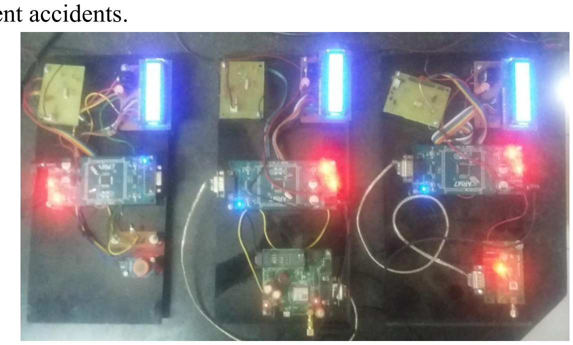

Fig. Hardware module for three CAN FD nodes

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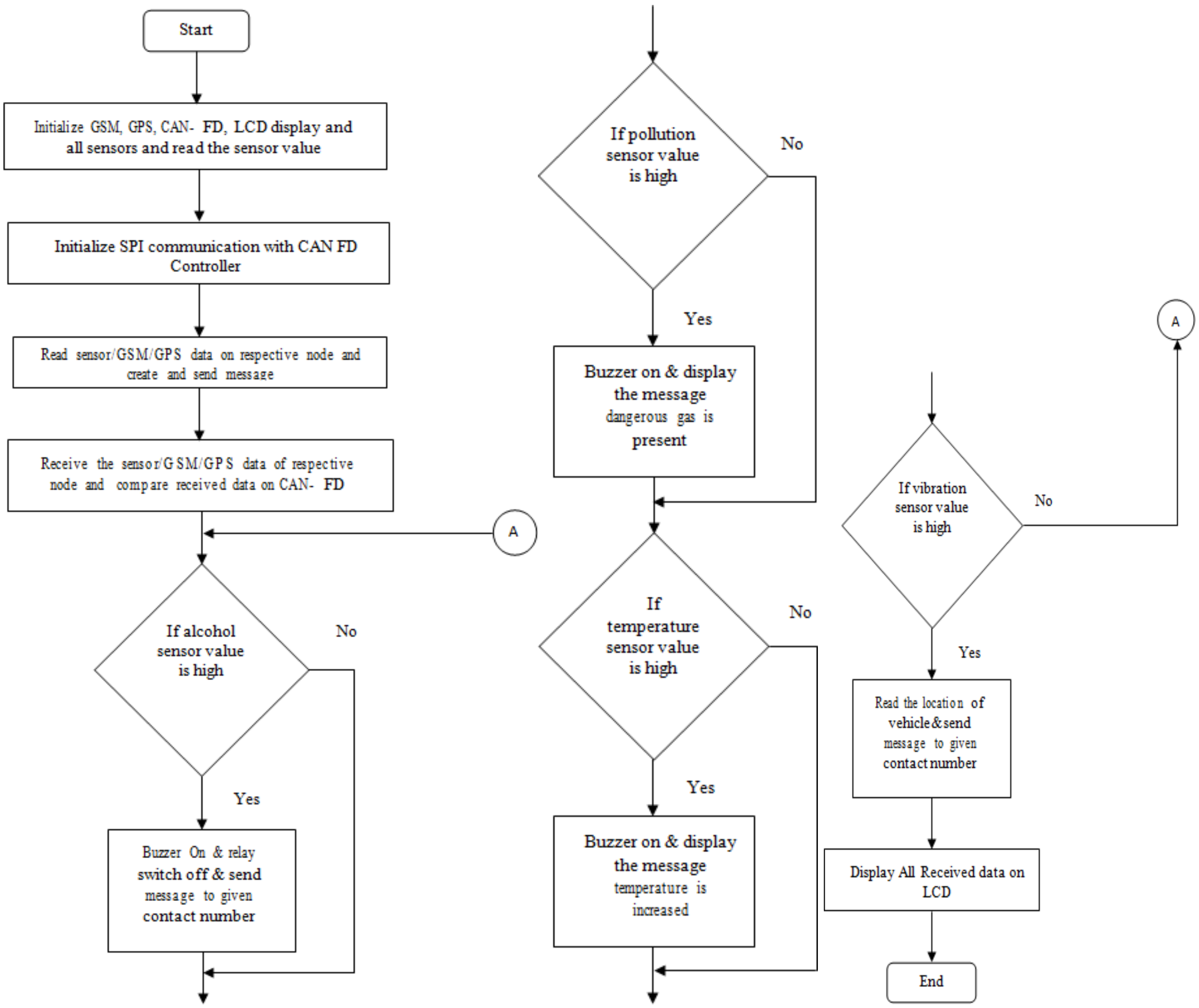
FLOW CHART



Flow Chart of CAN FD Bus System

VI. CONCLUSION

Design of CAN FD bus system for vehicle automation based on ARM7 microcontroller has achieved the objectives which are decided at the beginning of the dissertation. The basics of CAN FD Bus protocol can be understood. The software and hardware can be used to construct a fully working CAN FD bus for vehicle automation, at various levels of complexity. Fundamentals of packet arrangement can be observed and understood. This System presents vehicle location tracking & accident detection & prevention using CAN_FD protocol. It provides more than 70% safety for four wheelers. It is the fact that implementation of the system will increase the cost of the vehicle but it is better to have some percent safety rather than having no safety. The receiver can get the current location of the vehicle using a mobile phone. Thus this system provides reliable tracking and efficient communication with reduced system complexity. Automatic accident detection and reporting system is designed which reports the user when an accident occurs, which is sensed by a sensor. Short messages, including location of accidents obtained using GPS, are sent via the GSM network.

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