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L Navaneeth
PG Student,
Department of Control and Instrumentation Engineering,
Sri Ramakrishna Engineering College, Coimbatore-641022

Dr. V Rukkumani
Assistant Professor,
Department of Electrical and Instrumentation Engineering,
Sri Ramakrishna Engineering College, Coimbatore-641022

Correspondence
L Navaneeth
PG Student,
Department of Control and Instrumentation Engineering,
Sri Ramakrishna Engineering College, Coimbatore-641022

Automatic vehicle control using can protocol

L Navaneeth, Dr. V Rukkumani

Abstract
The main design and aspects of Controller Area Network (CAN) based accident avoidance system is to avoid the accidents by using CAN protocol. This project defines a design of effective accident avoidance system that detects an automotive vehicle condition while travelling, with the help of ultrasonic sensors and this signal can be used to control the Engine Control Unit (ECU). Present Automobiles are being developed by more of electrical parts for efficient operation. The communication section used in this project is embedded networking by CAN which has efficient data transfer. It also takes feedback of vehicle disorders like Vehicle speed, Engine temperature etc., and controlled by main controller. Additionally this unit furnished with GSM which communicates to the owner during emergency situations.

Keywords: CAN (Controller Area Network), MCU (Main Control Unit), ECU(Engine Control Unit).

1. Introduction

The CAN bus was developed by BOSCH as a multi-master, message broadcast system that specifies a maximum signaling rate of 1 megabit per second (bps). Unlike a old-fashioned network such as USB or Ethernet.

CAN does not send huge blocks of data point-to-point from node A to node B under the supervision of a central bus master. In a CAN network, many small messages like temperature or RP Mare broadcast to the entire network, which provides for data stability in every node of the system. Once CAN basics such as message format, message identifiers, and bit-wise arbitration a main benefit of the CAN signaling scheme are explained, a CAN bus implementation is examined, typical waveforms presented, and transceiver features examined.

1.1 Can Message

A fundamental CAN characteristic is the opposite logic state between the bus, and the driver input and receiver output. Generally, a logic-high is associated with a one, and a logic-low is associated with a zero - but not so on a CAN bus. This is why TI CAN transceivers need the driver input and receiver output pins passively pulled high internally, so that in the nonappearance of any input, the device automatically defaults to a recessive bus state on all input and output pins. Bus access is event-driven and takes place randomly. If two nodes try to occupy the bus simultaneously, access is executed with a non-negative bit-wise arbitration. Nondestructive means that the node winning arbitration just remains on with the message, without the message being destroyed or corrupted by another node.

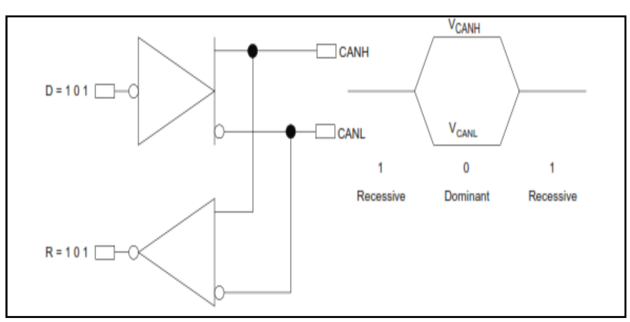

Fig 1.1: Block diagram of CAN arbitration

Figure 1.1 shows the allocation of priority to messages in the identifier is a feature of CAN that makes it particularly striking for use within a real-time control environment. The lower the binary message identifier number, the higher its priority. The propagation delay of a signal in the internal loop from the driver input to the receiver output is typically used as a qualitative amount of a CAN transceiver. This propagation delay is referred to as the loop time (LOOP in a TI data sheet), but takes on variednom enclosure from vendor to vendor.

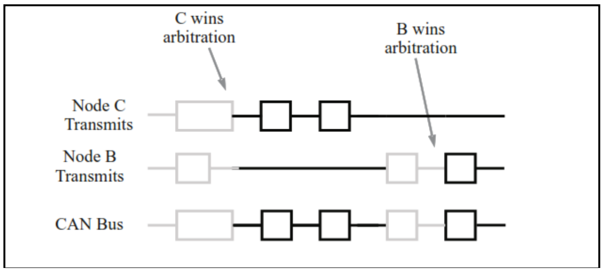

Fig 1.2: CAN arbitration process

Figure 1.2 shows the CAN arbitration process that is handled automatically by a CAN controller because each node continuously screens its own transmissions, as node B's recessive bit is overwritten by nodeC's higher priority dominant bit, B spots that the bus state does not match the bit that it transmitted. Therefore, node B halts transmission while node C remains with its message. Another attempt to transmit the message is made by node B once the bus is released by node C. This functionality is portion of the ISO 11898 physical signaling layer, which means that it is contained entirely in the interior of the CAN controller and is completely transparent to a CAN user.

2. Block Diagram of Emergency Braking System

Figure 2.1 shows the overall block diagram of the proposed system. Ultrasonic sensor provides an easy method of distance measurement. This sensor is seamless for any number of applications that require you to perform measurement among moving or stationary objects. Interfacing to a microcontroller in a snap a single input output pin is used to bigger an ultrasonic burst.

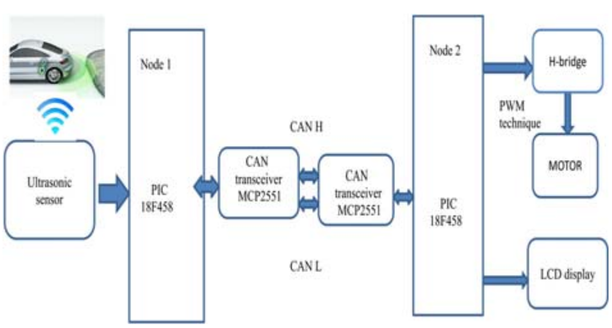

Fig 2.1: Block diagram of emergency braking system

The sensor measures the time required for the time required for the echo returns and return this value to the microcontroller as a variable width pulse via same input and output pin. Ultrasonic measurement work in any lighting condition making this a good choice to increase infrared object detectors. Simple pulse in and out requires just one input and output pin. Burst indicator LCD shows the measurement in progress.

2.1 Ultrasonic Sensor

2.1.1 Sound and Ultrasound Principles

Sound is a automatic vibration transmitted by an elastic medium. The range of frequencies that human can hear are around between 20 Hz and 20,000 Hz. This range is by definition the audible spectral and varies by individual and mostly decreases with age. The ear is most sensitive to frequencies around 3,500 Hz. Sound above 20,000 Hz is famous as ultrasound, and sound below 20 Hz as infrasound.

2.1.2 Speed of Sound

The speed which sound travels depends on the medium which it permits through. In general, the speed of sound is proportional (the square root of the ratio) to the toughness of the medium and its density. This is a fundamental property of the medium. Physical properties and the speed of sound conversion with the conditions in the environment. The speed of sound in the air depends on the temperature.

2.1.3 Sound Reflection

To measure the distance of a sound signal transmitted, it needs to be reflected. This sound indication is a longitudinal sound wave that strikes a flat surface. Sound is then reflected, provided that the dimension of the insightful surface is large compared to the wavelength of the sound surface an ideal target surface is rigid and smooth. This surface reflects a greater amount of signal than a soft, rough surface. A weak echo is the result of a minor or soft object. This reduces the operating distance of an ultrasonic sensor and decreases its accuracy.

2.1.4 Distance

The shorter the distance from the ultrasonic sensor to an object, the stronger the returning echo. Therefore, as the distance growths, the object requires better reflective characteristics to return a sufficient echo.

2.1.6 Angle

The inclination of an item surface facing the ultrasonic sensor affects how the object reflects. The portion perpendicular to the sensor proceeds the echo. If the entire object is at a greater angle, the signal is reflected away from the sensor and no echo is detected.

2.2 Software Used For Can Programming

2.2.1 MikroC PRO

MikroC is a full-featured ANSI C compiler for 5 dissimilar microcontroller architectures. It is the best solution for emerging code for your preferred microcontroller. It structures intuitive IDE, powerful compiler with advanced SSA optimizations, stacks of hardware and software libraries, and further tools that will help you in your work. Each compiler comes with comprehensive Help file and stacks of ready-to-use examples considered to get you started in no time. Compiler license contains free upgrades and a product lifetime tech care, so you can rely on our help while developing. It is the finest solution for developing code for PIC devices.

2.3 Can Programming
CAN programming codes are done with the help of mikroC. CAN program has be implemented for both transmitter and receiver and this CAN protocol can act as transreceiver. This programming is dumped in both the nodes of PIC18F458 and this logic is converted to CAN logic by using MCP2511. After the conversion to CAN logic the information from one node to another node is done using CAN protocol. CAN H is used to carry the high priority bit and the CAN L is used to carry the low priority bit. LCD display is connected along with two nodes in order to display the status of each node. There are two cases in which the programming is done one is during the normal running that is distance above 30cm and other is emergency case that is distance below 30 cm.

3. Hardware Description
3.1 Hardware Design
Figure 3.1 shows the hardware design of emergency braking system using ultrasonic sensor

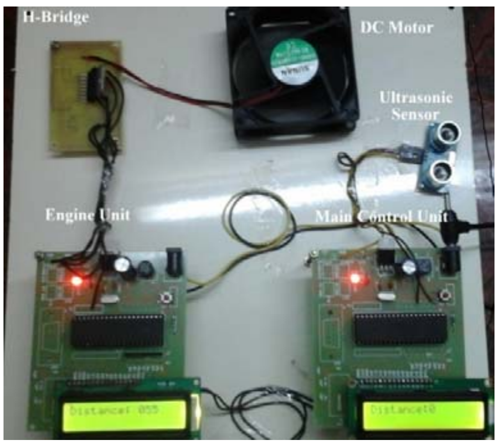

Fig 3.1: Prototype model of emergency braking system

3.2 Ultrasonic Sensor
Ultrasonic sensor measures range of 30cm in this project has programmed. Whenever the obstacle is detected below the range of 30cm then this sensor comes into act. The Trigger signal detects the object and this is reflected back to Echo signal and then the ultrasonic principle get acted. The indication of this ranges are detected in the LCD display .Whenever the range is above 30cm then the motor runs continuously and whenever the range gets below 30cm then the motor stops running.

3.3 PIC18F458
It includes a powerful microchip PIC18F458 microcontroller with 32 kb internal flash memory .It operates at a speed at 10 MHz. It is a direct in-circuit programming and it is easy for program updates. In this pin it is connected upto 32 input/output points with standard heads. It is 8 channel 10 bit analog to digital converter. It has 16-bit timer with three 8-bit timers .It has powerful programming LED. This is used has controller for real time system.

3.4 MCP2511
The MCP2551 is a high-speed CAN transceiver, fault-tolerant device that assists as the interface between a CAN protocol controller and the PIC18F458. The MCP2551 provides differential transmit and receive ability for the CAN protocol controller and is fully compact, including 24V requirements. It will operate at speeds of up to 1 Mb/s.

3.5. DC Motor –Flowchart
Figure 3.2 Shows the flow diagram of motor ON/OFF condition

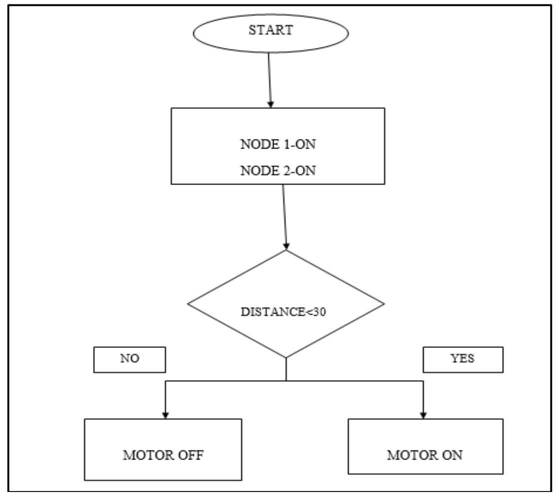

Fig 3.2: Flow diagram for DC motor ON/OFF condition

3.6 Motor ON Condition
Motor will be in continuous running condition when the distance measured is above 30 cm so whenever there is no object detected the motor will be ON state.

3.7 Motor OFF Condition
Ultrasonic sensor are used in continuous measuring of the object and also it measures the distance. Here in this project the ultrasonic sensor measures the range upto 30 cm. whenever the object is detected below the range of 30 cm then H-bridge acts to stop the motor. So the motor gets stops when the distance measured is below 30 cm.

4. Results and Discussion
Ultrasonic sensor measures the range of the object and this distance will be displayed in the LCD. So there will be a continue measure of the distance in travelling. This sensor used to sense the object at the range of 30cm. During the range at 30cm or when it gets below the range of 30cm then there will be an emergency case. So at this time of instant the CAN protocol will act at the speed of 1mbps and gives an automatic braking to the vehicle. This vehicle will take the braking automatically and controls the total vehicle speed in the case of emergency. This is case where the emergency position takes place at the range of 30cm it detects the objects and gives the emergency condition so the automatic vehicle control will takes place in this case we can prevent the accident. Whenever the distance is above 30cm then there will a continuous running of vehicle without any disturbances. When this range is reduced to 30cm there will be an emergency case so the sensor will act and the automatic vehicle control will takes place. In this case when the object is detected at the range of 30 cm and if the driver applies a continuous acceleration the speed of the vehicle will be reduced and there will be no speed increase if the driver gives acceleration also.

"In Case Of No Object Is Detected"

Fig 4.1: LCD display when no object found

"In Case Of Object Detected"

Fig 4.2: LCD display for emergency case

These are the two cases which displays on the LCD screen. There is interaction between the two LCD displays the data which are transferred between the two node 1 and node 2 is displayed in the LCD display. As mentioned LCD will displays two conditions that is during the distance above 30cm then it will display has no object found and when the distance range below 30cm it will display has emergency.

5. Conclusion and Future Scope

5.1 Conclusion

CAN protocol act as a transceiver so there will an interconnection of all nodes will be done using the CAN protocol. Here there are two nodes connected using CAN protocol they are Main Control Unit and the Engine Unit. Whenever the distance is measured using the ultrasonic sensor the distance is displayed in node 1 and the data is transferred to node 2. When the distance measured is above the range of 30cm then there will a continuous running of motor and when the distance measured is below 30cm then there will be an emergency case then automatic vehicle control will takes place and the motor stops running. This motor is controlled using pulse width modulation technique and H-Bridge is connected has an external hardware for the rotation of the motor.

5.2. Future Scope

This ultrasonic sensor can be implement in all the sides of the vehicle and this is used to sense in all the direction. The range at which the distance should be measured can be adjusted by the user. This sensor can be used in two modes ON/OFF modes. In the case of driving in highway then this sensor can be kept at ON and in case of traffic or during the vehicle parking this sensor can be kept at OFF. Since the cost of the Ultrasonic sensor is less when compared with RADAR sensor. This ultrasonic sensor can be implemented in lower end vehicle and avoid accidents and to save the passenger life.

6. References

1. Agarwal V, Murali NV, Chandramouli C. A cost-effective ultrasonic sensor based driver assistance system for congested traffic conditions, IEEE Trans. Intell. Transp Syst. 2013; 10(3):486-498.
2. Altafini C, Speranzon AK, Johansson. Hybrid Systems Computation and Control, Berlin, Germany: Springer- Verlag, 2006, 439-469.
3. Carullo A, Parvis M. An ultrasonic sensor for distance measurement in automotive applications, IEEE Trans. Instrum. Meas, 2001; 1(2):143-147.
4. Cook PA. Stable control of vehicle convoys for safety and comfort, IEEE Trans. Autom. Control, 2013; 52(3):526-531.
5. Cleary J, Witten. Data Compression Using Adaptive Coding and Partial String Matching, IEEE Transactions on Communications, 2003; 32:396-402.