VEHICLE CONTROL SYSTEM USING CAN PROTOCOL.

Abstract— This paper is an attempt to analyze Vehicle Control System Implementation Using CAN Protocol. In this paper we have given an effective way by which we can increase the car safety. This paper presents the development and implementation of a digital driving system. The ARM based data acquisition system that uses ADC to bring all control data from analog to digital format. The communication module used in this paper is embedded networking by CAN which has efficient data transfer. The CAN Protocol it was necessary for the different control systems (and their sensors) to exchange information. This was usually done by discrete interconnection of the different systems (i.e. point to point wiring). The requirement for information exchange has then grown to such an extent that a cable network with a length of up to several miles and many connectors was required. The benefits of CAN is effectively implemented in vehicle it is used for achieving automation, over other tradition schemes it will offer increase flexibility and expandability for future technology. Generally a vehicle was built with an analog driver-vehicle interface for indicating various vehicle statuses like speed, fuel level, Engine temperature etc. The CAN is provide a high speed and the capacity is high it is capable for handling a large number of parameter with more efficiently , then we add FOTA concept (Flash Over The Air) it allowing the innovative technology to simply and reliably optimize the vehicle without requiring a visit to the repair shop. it also makes new or improved functions available directly to the driver.

HARDWARE STRUCTURE---

1. Power Supply
2. ARM Microcontroller
3. DC Motor
4. (16x2) LCD Display
5. Sensors (Light , Fuel , Obstacle , Temperature)
6. CAN Controller
7. CAN Transceiver
8. Buzzer
9. LED

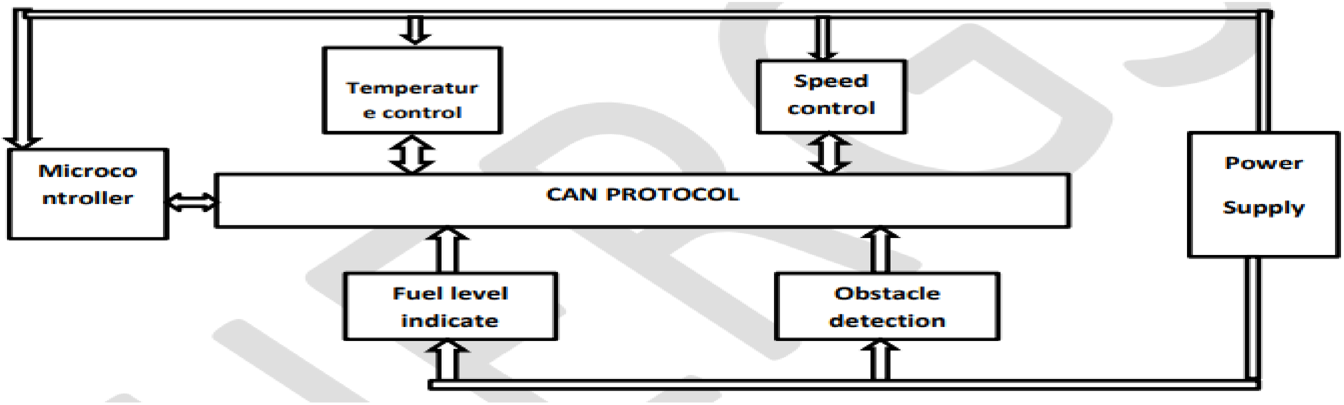


Figure 1 : HW Structure

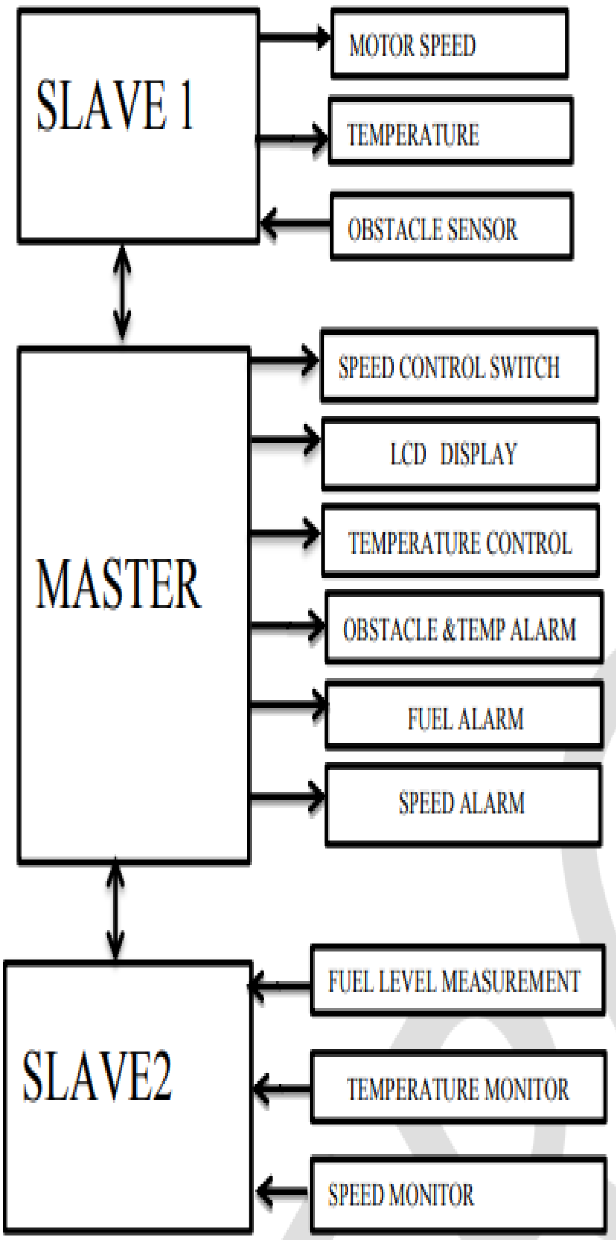


Figure 2 : Block Diagram

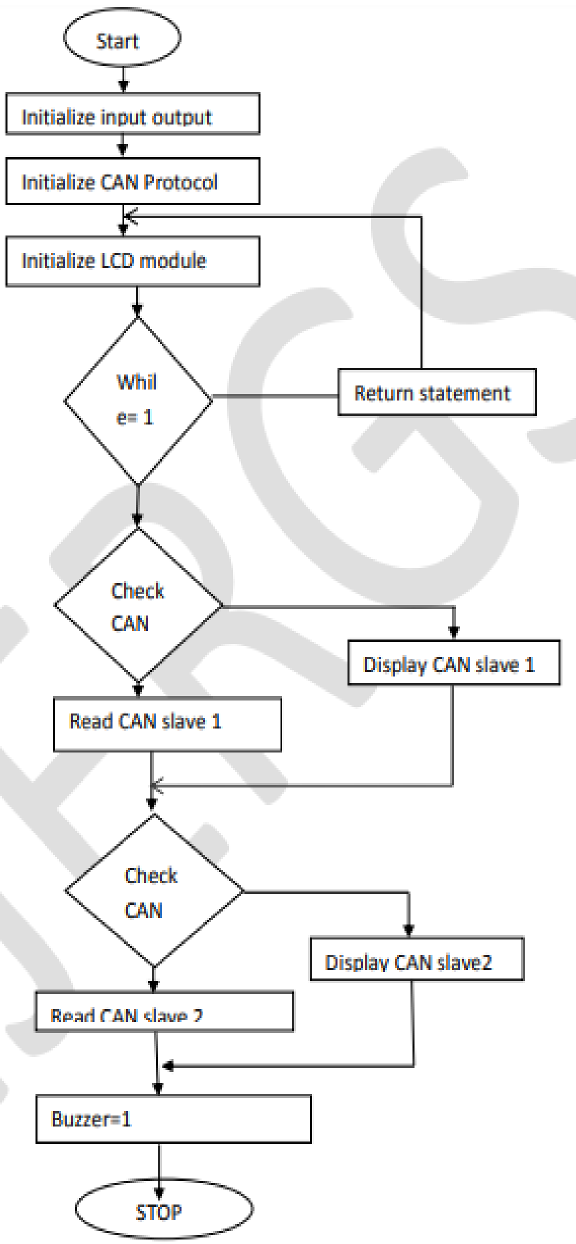


Figure 3 : SW Structure

LITERATURE SURVEY –

- CAN BUS : In February of 1983, Robert Bosch GmbH introduced the Controller Area Network (CAN) serial bus system at the Society of Automotive Engineers (SAE) congress. It was the hour of birth for one of the most successful network protocols ever. Today, almost every new passenger car manufactured in Europe is equipped with at least one CAN network. Used also in other types of vehicles, from trains to ships, as well as in industrial controls, CAN is one of the most dominating bus protocols – maybe even the leading serial bus system worldwide.

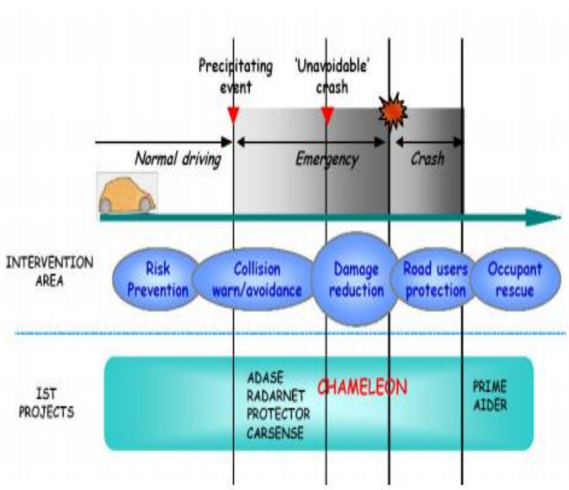
1983	Start of the Bosch internal project to develop an in-vehicle network
1991	Bosch's CAN specification 2.0 published
1992	CAN in Automation (cia) international users and manufacturers group established
1992	First cars from Mercedes-Benz used CAN network
2000	Development of the time-triggered communication protocol for CAN (TTCAN)

Figure 4 : Literature review of CAN

- Automotive safety may have become an issue almost from the beginning of mechanised road vehicle development. In our article we spotlight on important four elements in safety control system in vehicle :
  - ❖ Light : Early road vehicles used fuelled lamps, before the availability of electric lighting. The Ford Model T used carbide lamps for headlamps and oil lamps for tail lamps. It did not have all-electric lighting as a standard feature until several years after introduction. Dynamos for automobile headlamps were first fitted around 1908 and became commonplace in 1920s automobiles.

Figure 5 : Carbide Lamp

❖ Obstacle Detection : Pre-Crash Sensing (PCS) systems are based on the three functions of IVS (Intelligent Vehicle System) : (1) Sensing: To detect the relevant obstacle into the traffic and the infrastructure, (2) Monitoring: To inform the vehicle of the obstacle characteristics and (3) Acting: To take decision for automatic deployment of passive safety devices and/or active safety devices to mitigate and/or to avoid the crash. Now they using RADAR , LADAR and Sensing cameras.



	Criteria	Type	PSA	Renault	Porsche	Volvo	CRF	Rank
Infrastructure	Fixed obstacles into the environment	Pole/Tree	1	2	1	1	1	**2** (6)
		Wall	2	4	2	2	1	**3** (11)
		Security Rail	2	4	2	2	1	**3** (11)
		Ditch	4	5	3	3	4	7 (19)
Traffic	Potentially moving obstacles	Car	1	1	1	1	1	**1** (5)
		Truck, bus	1	1	2	1	1	**2** (6)
		Pedestrian	2	2	3	4	4	**5** (15)
		Bicycle	2	2	3	3	3	**4** (13)
		Motorcycle	2	2	3	2	2	**3** (11)
		Animal	3	3	4	3	3	**6** (16)

(1 → most important, 5 → less important)

Figure 6 : Obstacle Detection

❖ Temperature : The invention of the automobile water radiator is attributed to Karl Benz. Wilhelm Maybach designed the first honeycomb radiator for the Mercedes 35hp. Radiators are heat exchangers used for cooling internal combustion engines, mainly in automobiles but also in piston-engined aircraft, railway locomotives, motorcycles, stationary generating plant or any similar use of such an engine.

Figure 7 : Radiator

- ❖ Fuel : In 1769 the first steam-powered automobile capable of human transportation was built. In 1803 an early internal combustion engine that was fueled by hydrogen. In 1823 the first industrially applied internal combustion engine. In 1870 the first combustion engine powered pushcart, followed by four progressively more sophisticated combustion-engine cars over a 10-to-15-year span that influenced later cars. In 1882 the first petrol-powered vehicle. In 1885 a petrol or gasoline-powered automobile. In 1892 the first four-wheeled petrol-driven automobile was built.

- FOTA Concept : Current trends forecast that Over-the-Air (OTA) software updates will be highly significant for future connected vehicles. The OTA update will enable upgrading the vehicle functionalities or bug fixations in the embedded software installed on its Electronic Control Units (ECUs) remotely. The introduction of OTA updates in the automotive industry has brought many advantages for both the Original Equipment Manufacturer (OEM) and the driver/owner. However, in terms of security, OTA updates are highly critical as they need complete access to the in-vehicle communication network. This survey highlights and discusses OTA software updates in the automotive sector, mainly from the security perspective. The major objective of this survey is to deliver a comprehensive outline of various research directions and approaches in OTA update technologies in vehicles. At first, we discuss the connected vehicle technology and then integrate the relationship of OTA update features with the connected vehicle. We further discuss both promising and secure OTA update approaches, that have gained a lot of attention recently. Furthermore, we present a comprehensive comparative study of the existing OTA update approaches on the basis of strengths, weaknesses and evaluation setup. The survey also focuses on the existing vehicle features that support OTA updates, and customer satisfaction and usability. Finally, we identify possible future research directions of OTA updates for automobiles, particularly in the area of security.

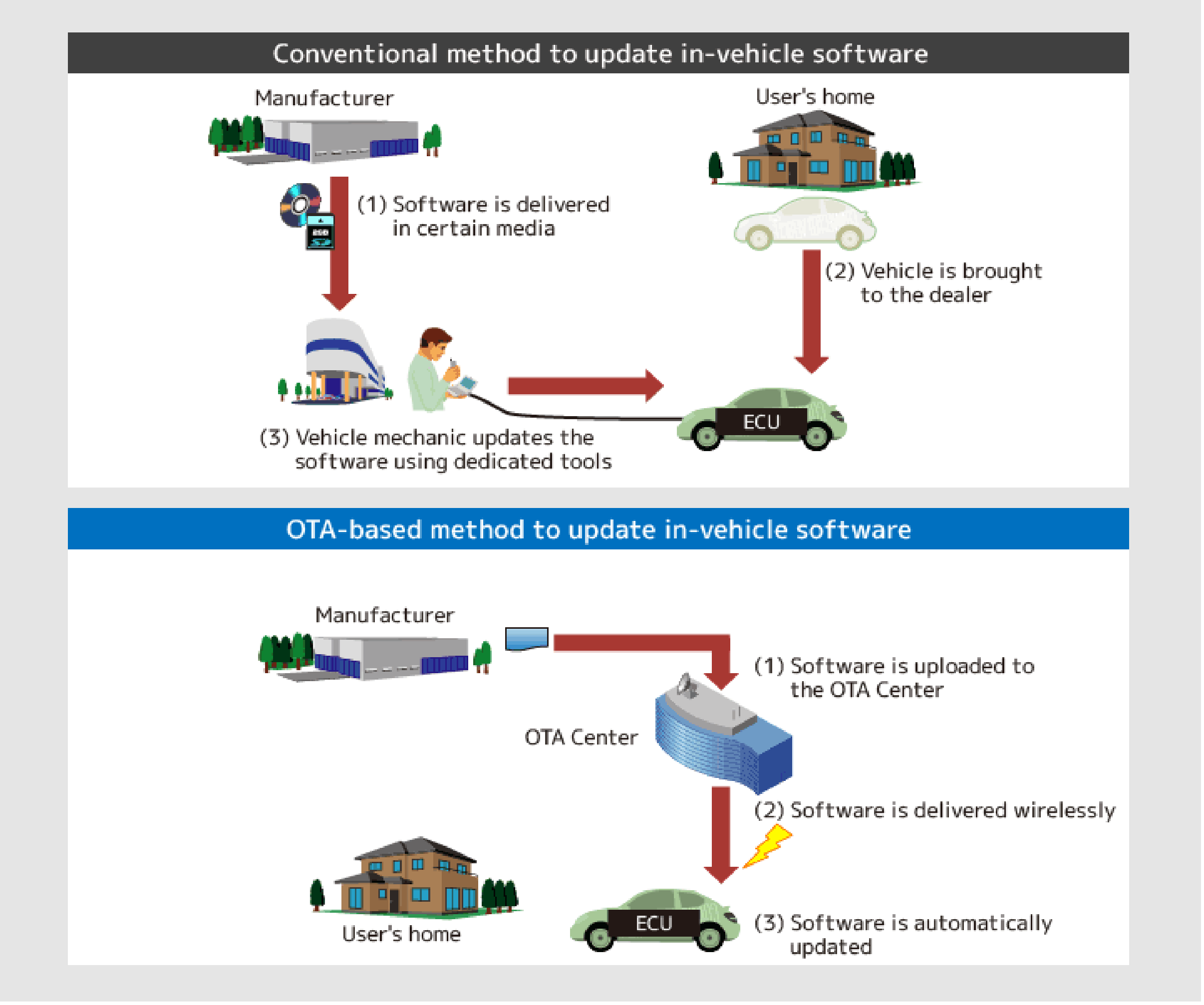


Figure 8 : OTA Concept

Total Cost--

unit name	Number of units	Price of a unit	Total Cost
ARM STM32f10	3	300.00 LE	900.00LE
MCP2551	3	50.00 LE	150.00LE
AC Transformer	3	150.00 LE	450.00LE
LCD display	3	100.00 LE	300.00LE
Buzzer	1	20.00 LE	20.00LE
Temperature sensor LM35	1	40.00 LE	40.00LE
Photoresistor (LDR)	1	20.00 LE	20.00LE
Fuel sensor	1	150.00 LE	150.00LE
DC motor	1	50.00 LE	50.00LE
Wifi ESP8266	1	150.00 LE	150.00LE
Obstacle Sensor LM393	1	30.00LE	30.00LE
Total Cost			**3000.00LE**