DRIVERLESS VEHICLE CONTROL USING CAN BUS AND ELECTRONIC DISTRIBIUTION UNIT

V.Prabhakaran, S.Pavithra, V.Cholapandian

Abstract— Now-a-days lot of research has been going to improve the safety of road environments and reduce the risk of unsafe traffic areas. This research was mainly focused on the local perception with embedded sensors and its potential reaction on hazardous situation. Its extension is essential to minimize risk and maximize the security of the road traffic. To achieve such additional works is required to implementation of a lot of devices of ten very expensive. As an advent to the technology in near future the road will be designed for a perfect cruise control. This paper is aimed to design a driverless automated vehicle module to ensure a better cruise control; in addition to this the vehicle is embedded with GOOGLE maps for a better navigation. The mechanical actuators are replaced with "Electronic Distribution Unit" which in turn controlled by "Control Area Network". This vehicle can also be monitored & guided by a server machine to ensure a better cruise control with secured traffic rules.

Index Terms— Control Area Network (CAN), Electronic Distribution Unit (EDU), GPS/GSM, PS.

1 INTRODUCTION

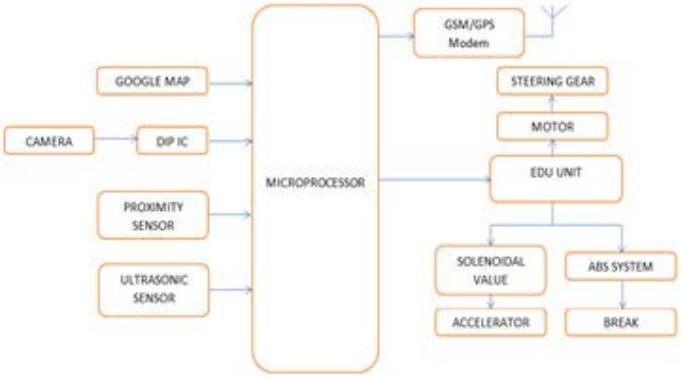
The CAN (Controller Area Network) is a serial bus communications protocol developed by Bosch in the early 1980s. It defines a standard for efficient and reliable communication between sensor, actuator, controller, and other nodes in real-time applications. The privies Controller Area Network development was mainly supported by the vehicle industry. Today Controller Area Network is found in a variety of passenger cars, trucks, boats, spacecraft, and other types of vehicles. Today CAN protocol is also widely used for industrial automation and other areas of network based on embedded control system.

The mechanical fly-weight governors of inline and distributor diesel fuel injection pumps used to control fuel delivery under a variety of engine loads and conditions could no longer deal with the ever increasing demands for efficiency, emission control, power and fuel consumption. These demands are now primarily fulfilled by the Electronic Control, the system which provides greater ability for precise measuring, data processing, operating environment flexibility and analysis to ensure efficient diesel engine operation. The EDC replaces the mechanical control governor with an electromagnetic control device.

In this paper, CAN & EDU is used for superior control of vehicle steering wheels, Diesel/Petrol pump, Breaks, Acceleration control, Automated speed adjustment by replacing mechanical components to sensors and electronic actuators.

2 BLOCK DIAGRAM

2.1 Vechile Module



Vehicle module explanation

Initially the motion picture (Video) is captured with a Full High Definition camera and given to the Digital Image processing IC for processing the histogram levels and grey or binary level of the continuously varying images. This binary levels and histogram levels are given to the microprocessor for analyzing. A Google map is embedded with GSM/GPS module for identifying the correct location of the vehicle, and also for the path guidance of effective navigation. After identifying the path of the destination, microprocessor communicates to

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an Electronic Distribution Unit (EDU) unit for automated vehicle drive.

Electronic Distribution Unit (EDU) is embedded with steering control with Motors, accelerator with solenoid petrol/diesel valve and break with ABS technology. Once the destination is fixed by the user, the camera gets the image of the location and it is processed with a DIP cum Microprocessor and then it triggers the solenoid value to pump the petrol/diesel for acceleration and the steering wheels are controlled by the data got by GOOGLE MAP cum GPS/GSM by perfect path guidance. Any obstacles, pedestrian cross, vehicle intrusion is sensed by proximity sensor and ultrasonic sensor, speed of the vehicle is reduced by ABS Breaking system.

2.2 Control Module

Control Module Explanation

This entire automated system can be monitored by a server machine with a GPS/GSM Transceiver cum microcontroller. This monitoring system can be in traffic control room for better monitoring against traffic violation.

3 BLOCK EXPLANATION

3.1 CAMERA

A **camera** is an optical instrument. Its records images and that image can be stored directly, or transmitted to another location, or both. These images may be still photographs or moving images such as videos or movies.

3.2 COMPUTATION IN DIP IC

3.2.1 GRAYSCALE

In photography computing to **grayscale,** the **greyscale** image are digital image at which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this sort, also known as black-and-white, are composed exclusively of shades of gray, varying from black at the weakest intensity to white at the strongest. Grayscale images are distinct from one-bit bitonal black-and-white images, computer images are only two colors, black, and white (also called *bilevel* or *binary images*). Grayscale images are measuring the intensity of light at each pixel in a single band of the electromagnetic spectrum (e.g. infrared, visible light, ultraviolet, etc.), they are monochromatic proper when only a given frequency is captured. But also they can be synthesized from a full color image.

3.2.2 HISTROGRAM

Histogram is a graphical representation of the distribution of data. Histogram is a representation of tabulated frequencies, shown as adjacent rectangles or some situations, erected over discrete intervals (bins), with an area proportional to the frequency of the observations in the interval. The frequency divided by the width of the interval. The total area of the histogram is equal to the number of data. A histogram may also be normalized displaying relative frequencies. It then shows the proportion of cases that fall into each of several. The categories are usually specified as consecutive, nonoverlapping intervals of a variable. The categories (intervals) must be adjacent, and often are chosen to be of the same size. The rectangles of a histogram are drawn so that they touch each other to indicate that the original variable is continuous.

Histograms are used to plot the density of data, and often for density estimation: estimating the probability density function of the underlying variable.

3.2.3 BINARY IMAGE

A binary image is a digital image that has only two possible values for each pixel. Two colors used for a binary image are black and white though any two colors can be used. The color used for the object in the image is the foreground color while the rest of the image is the background color.

Binary images are also called bi-level or two-level. This means that each pixel is stored as a single bit-i.e., a 0 or 1. The names black and white, B&W, monochromatic or monochrome are often used for this concept, but also design any images that have only one sample per pixel, such as grayscale images.

3.3 MICROPROCESSOR

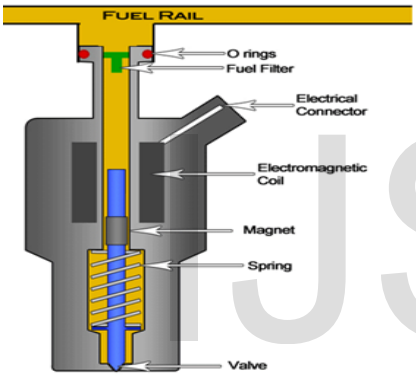
A **microprocessor** incorporates the functions of a computer's central processing unit (CPU) on a single integrated circuit (IC). All modern CPUs are microprocessors making the *micro-* prefix redundant. The microprocessor is a multipurpose, programmable device that accepts digital data as input, processes it according to instructions stored in its memory, and provides results as output. It is example

of sequential digital logic, it has internal memory. Microprocessors operate on numbers and symbols represented in the binary numeral system.

3.4 SOLENOID VALVE

A **solenoid valve** is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid, in the case of a two-port valve the flow is switched on or off, in the case of a three-port valve, the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold.

Solenoid valves are the most frequently used control elements in fluidics. Solenoids valve are safe and faster switching, and solenoids valve having a high reliability, and long service life, good medium compatibility of the materials used, low control power and compact design.



Electronically Controller Solenoid Valve

Working of the Solenoid Valve

The sensor senses the process towards the outlet side of the solenoid valve. When it senses that quantity flow of fluid is required, it allows the current to pass through the solenoid valve. The valve gets are open and the magnetic field is generated which triggers the movement of the plunger against the action of the spring. Due to this the plunger moves in upwards direction, which allows the opening of the orifice. At this instant the flow of the fluid is allowed from the inlet port to the outlet port.

If the constant current passing through the solenoid valve position of the plunger and hence opening of the orifice remains constant. If the sensor senses that more flow of the fluid is required, it allows the increase in current passing through the solenoid valve, it creates more magnetic field and more upwards motion of the plunger. If the required flow of fluid is less, the sensor is sending lesser current to the solenoid valve.

When the sensor senses that the fluid is no more required in the process, it stops the flow of the current to the solenoid valve completely. Due to this the solenoid valve gets de-energized and the plunger reaches the bottom most position and closes the orifice completely thus stopping the flow of fluid from the inlet port to the outlet port.

In this way the solenoid coil operates the valve as if it is being operated by the human being. When the flow of certain quantity of fluid is required it opens the valve to required extent and when the flow is not required it shuts the valve entirely.

3.5 GOOGLE MAP

Google Maps is a desktop and mobile web mapping service application and technology provided by Google, offering satellite imagery, street maps, and Street View perspectives, as well as functions such as a route planner for traveling by foot, car, bicycle , or with public transportation. The redesigned version was met by user criticism regarding slowness, hiding some common functions, removing a scale bar, and lack of other features that include My Places and sharable customized links to parameterize split Street View and Map views. It is possible to switch back to the old version.

Google Maps uses a close variant of the Mercator projection, and therefore cannot accurately show areas around the poles. A related product is Google Earth, a stand-alone program which offers more globe-viewing features, including showing polar areas.

3.6 GSM

It was first developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobile phones. It is the default global standard for mobile communications with over 90% market share, and is available in over 219 countries and territories.

The GSM standard was developed as a replacement for first generation (1G) analog cellular networks, and originally described a digital, circuit-switched network optimized for full duplex voice telephony. This was expanded over time to include data communications, first by circuit-switched transport, then packet data transport via GPRS (General Packet Radio Services) and EDGE (Enhanced Data rates for GSM Evolution or EGPRS).Subsequently, the 3GPP developed third generation (3G) UMTS standards followed by fourth generation (4G) LTE Advanced standards, which are not part of the ETSI GSM standard."GSM" is a trademark owned by the GSM Association. It may also refer to the initially most common voice codec used, Full Rate.

3.7 PROXIMITY SENSOR

Proximity Sensor

A proximity sensor is a sensor to detect the presence of nearby objects without any physical contact. A proximity sensor is emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target. A capacitive or photoelectric sensor might be suitable for a plastic target an inductive proximity sensor always requires a metal target. This sensor can be detect the maximum distance is defined "nominal range". Some sensors have adjustments of the nominal range or means to report a graduated detection distance. Proximity sensors can have a high reliability and long functional life because of the absence of mechanical parts and lack of physical contact between sensor and the sensed object.

Proximity sensors are commonly used on smartphones to detect (and skip) accidental touchscreen taps when held to the ear during a call. They are also used in machine vibration monitoring to measure the variation in distance between a shaft and its support bearing. This is common in large steam turbines, compressors, and motors that use sleeve-type bearings. International Electro technical Commission (IEC) 60947-5-2 defines the technical details of proximity sensors. A proximity sensor adjusted to a very short range is often used as touch switch.

3.8 ULTRASONIC SENSOR

Ultrasonic Sensor

Ultrasonic Sensors are designed for both distance measurement and object detection in tough environments. Discrete output types are available for presence and absence detection, and are ideally suited for detecting objects, such as transparent objects, that cannot be reliably detected by other sensors. Among our sensors range, analogue output types are available for applications requiring a measurement of the target object, such as detecting the level of fluid in a tank.

A family of diffuse ultrasonic sensors with sensing range from100-1500mm, 200-2000 mm and 300-3500 mm with teach-in adjustment. An adjustment by teach-in makes it possible to set the analog angle according to the request sand program the output to no or nc switching as well. The outputs are either 0-10 v or 4-20 MA which make it an ideal choice for distance measurement, level measurement, diameter measurement or loop control with customized settings. Due to use of microprocessor control the digital filtering makes the sensor immune to most electromagnetic interferences.

4. CONCLUSION

The objectives of this paper were covered and achieved. This is done by automatic vehicle control using can bus application and EDU implementing GPS/GSM signal command as well as driving control . The direction of the vehicle can be selected using the specified controlled signal. Besides that, the development of this paper is done with less affordable cost.

This design not only reduces the manufacturing cost compared with present market but also will give great competitive with other types of vehicle control. However there are some improvements should be done to make it more reliable.

By improving this system, we directly enhance the life style of the people in the community. This kind of system could contribute to the evolution of the automatic vehicle control technology.

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