CHAPTER 1
INTRODUCTION

1.1 Overview :

Present Automobiles are being developed by more of electrical parts for efficient operation. Generally a vehicle was built with an analog driver-vehicle interface for indicating various vehicle status like speed, fuel level, Engine temperature etc., This project presents the development and implementation of a data acquisition system for improved the driver-vehicle interface. It uses an PIC based data acquisition system that uses ADC to bring all control data from analog to digital format and visualize through LCD. The communication module used in this project is embedded networking by CAN which has efficient data transfer. It also takes feedback of vehicle conditions like car cabin temperature and reverse parking distance etc.

1.2 Theory :

With rapidly changing computer and information technology and much of the technology finding way into vehicles. They are undergoing dramatic changes in their capabilities and how they interact with the drivers. Although some vehicles have provisions for deciding to either generate warnings for the human driver or controlling the vehicle autonomously, they usually must make these decisions in real time with only incomplete information. So, it is important that human drivers still have some control over the vehicle. Advanced in-vehicle information systems provide vehicles with different types and levels of intelligence to assist the driver. The introduction into the vehicle design has allowed an almost symbiotic relationship between the driver and vehicle by providing a sophisticated & intelligent driver-vehicle interface through an intelligent information network. This paper discusses the development of such a control framework for the vehicle which is called the digital-driving behavior, which consists of a joint mechanism between the driver and vehicle for perception, decision making and control.

A vehicle was generally built with an analog driver vehicle interface for indicating various parameters of vehicle status like temperature, pressure and speed etc. To improve the driver-vehicle interface, an interactive digital system is designed. A microcontroller based data acquisition system that uses ADC to bring all control data from analog to digital format is used. Since the in-vehicle information systems are spread out all over the body of a practical vehicle, a communication module that supports to implement a one stop control of the vehicle through the master controller of the digital driving system.

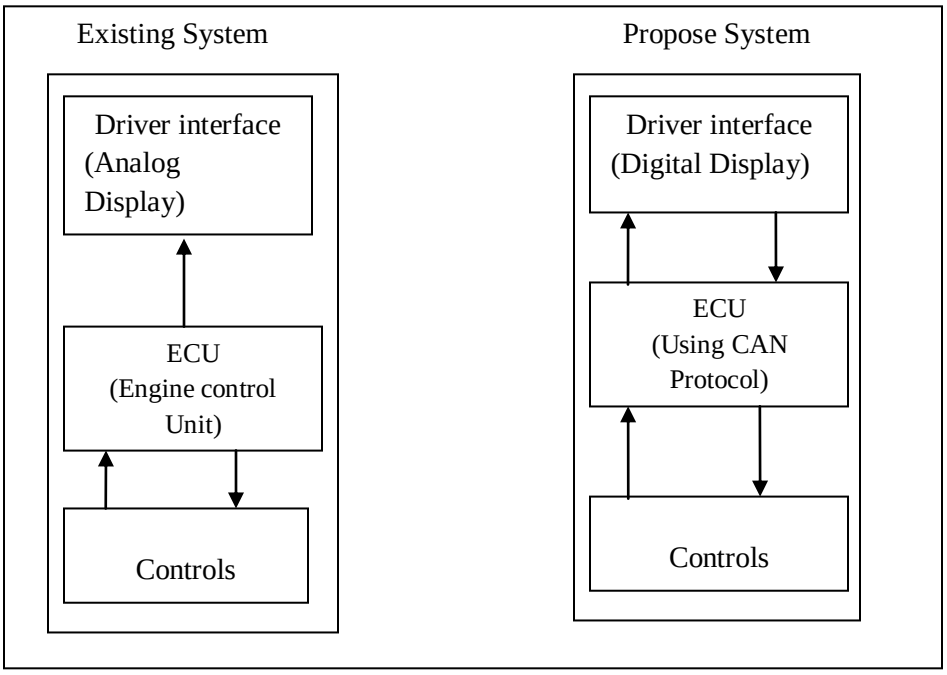

Fig. 1 vehicle control of existing and proposed system

1.3 Methods of measurement :

Sensor is used to convert the physical parameter (such as temperature, pressure, distance etc) into electrical signal. For this project we are selecting the following sensors:

1. Ultrasonic Sensor.
2. Temperature sensor.

1. Ultrasonic sensor

Parking sensors are proximity sensors for road vehicles designed to alert the driver while parking. These systems, which use either electromagnetic or ultrasonic sensors, are marketed variously by vehicle manufacturers under proprietary brand names such as Park Distance Control, Park Assist .

These systems feature ultrasonic proximity detectors to measure the distances to nearby objects via sensors located in the front and/or rear bumper fascias or visually minimized within adjacent grills or recesses. The principle of ultrasonic sensor is similar to sonar or radar in which interpretation of echoes from radio or sound waves to evaluate the attributes of a target by

generating the high-frequency-sound waves (around 40 kHz). The transducer used for converting energy into ultrasound or sound waves with ranges above human hearing range is called an ultrasonic transducer.

Fig 2. Ultrasonic sensor

The sensors emit acoustic pulses, with a control unit measuring the return interval of each reflected signal and calculating object distances. The system in turns warns the driver with acoustic tones, the frequency indicating object distance, with faster tones indicating closer proximity and a continuous tone indicating a minimal pre-defined distance. Systems may also include visual aids, such as LED or LCD readouts to indicate object distance. Rear sensors may be activated when reverse gear is selected and deactivated as soon as any other gear is selected.

2. Temperature sensor

A device which gives temperature measurement as an electrical signal is called as Temperature sensor. This electrical signal will be in the form of electrical voltage and is proportional to the temperature measurement.

Fig.3. Temperature sensor

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.

1.4 Problem Statement:

1. Accident Prevention

When a driver wants to reverse the car, they will look into the back mirror to see any obstacle behind the car before hit the accelerator. However, there were some blind spot that couldn't be seen by driver through the back mirror. With the development of ultrasonic sensors technology in the industry, driver now can avoid collision during reversing by using the ultrasonic sensor to act as an assistant to driver. Ultrasonic sensor ability to detect object in wide ranges have made it as the common sensor used for collision avoidance.

This kind of technology is really good but need a higher cost in order to install it. Due to that, this kind of system only be installed in the high end or luxury vehicles. For the middle and low end car, the cheaper system will be used to cut off the cost in order to penetrate the market with a reasonable price. From the research, there are a few factors why the accidents occurred because reverse parking problem happened:

1. Drivers fail to detect if there any obstacle behind the car.
2. The common alarm system is not efficient.
3. Driver unable to determine the distance between the car and an obstacle behind it.

In order to avoid accident and lost happen in the future, this project had been proposed to improve the ultrasonic system reliability in the car avoiding collision system especially to supply correct information to driver for the area that couldn't been seen during reversing the car.

In conclusion, Smart System of Ultrasonic Car Parking is a complete system which is needed by each driver to make sure their driving is safe and to prevent accident that caused by parking problem from happened.

2. Temperature problem inside Vehicle

These days a global warming typically very high of that ambient temperature especially during summer season. During summer if the cars are parked directly under the sun, cabin inside the car will experience a kind of greenhouse effect this will lead to higher cabin temperature and cause problems inside the car like color fading and seat upholstery wear and tear and even cause damage to other cabin elements. The high temperature prevailing inside the vehicle parked under the sunlight is definitely unreceptive to the occupants when they arrive to take a drive. This paper demonstrates a temperature measurements carried out inside a sedan car which was parked under the sunlight to study the temperature pattern inside a parked car. Passengers are also being affected with the thermal condition inside the vehicle itself. It's also very important to maintain a healthy environment inside vehicle.

1.5 Projects Objectives :

1. Study of power supply design for microcontroller board 5V, 1Amp.
2. Study of CAN protocol.
3. Study of Node concept.
4. Study of types of ADC.
5. Study of types of sensors.(Ultrasonic and Temperature)
6. Study of types of Signal conditioning circuit.
7. Study of Average sampling technique.
8. Study of RTC using on chip peripheral timer.
9. Study of profile concept.
10. Study of CAN transceiver MCP 2551.
11. Study of terminating resister & twisted wire pair.
12. Study of PIC18F458 CAN engine.
13. Study of RS232 protocol.

1. Study of power supply design for microcontroller board 5V, 1Amp.

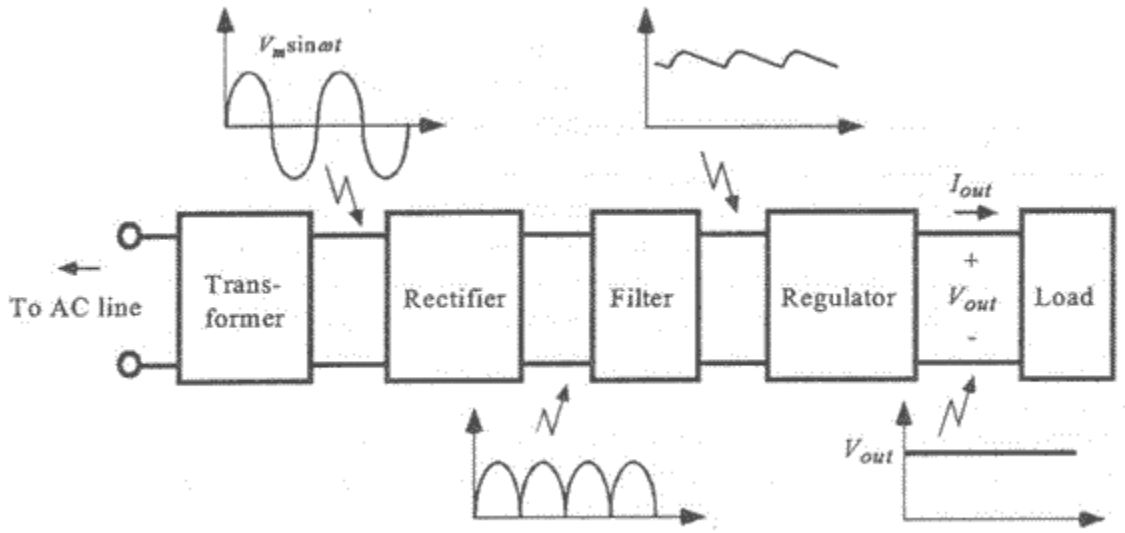

Fig 1.Component of power supply

Initial stage of every electronic circuit is power supply system which provides required power to drive the whole system. The specification of power supply depends on the power requirement and this requirement is determined by its rating. The main components used in supply system are:

1. Transformer
2. Rectifier
3. Input filter
4. Regulator
5. Output filter
6. Output indication.

1. Transformer:

The main source of power supply is a transformer. The maximum output power of power supply is dependent on maximum output power of transformer .We determine power from its current and voltage rating. e.g. if there is a transformer of 9V, 1A then maximum power delivered by transformer is 9 Watt. It means we can drive a load from this transformer up to 9w.

2. Rectifier:

Rectifier is a circuit which is used to convert ac to dc. Every electronic circuit requires a dc power supply for rectification. We have used bridge IC.

3. Input filter:

After rectification we obtain dc supply from ac but it is not pure dc it may have some ac ripples .To reduce these ripples we use filters. It comprises of two filters –low frequency ripple filter and high frequency ripple filter. To reduce low frequency ripples we use electrolytic capacitor. The voltage rating of capacitor must be double from incoming dc supply. It blocks dc and passes ripples to ground.

4. Regulator:

Regulator is a device which provides constant output voltage with varying input voltage. There are two types of regulators-

(a) Fixed voltage regulator

(b) Adjustable regulator

We have used fixed voltage regulator LM7805 last two digits signify output voltage.

5. Output filter:

It is used to filter out output ripple if any.

6. Output indication:

We use LED to observe the functioning of our system. If the LED glows it confirms proper functioning of our supply .We have used four power supply unit.

2. Study of ADC and Types of ADCs:

The heart of the computer-based data acquisition is usually the analog to digital converter (ADC). Basically this device is a voltmeter. Its input is voltage and its output is a digital number (a collection of 0's and 1's) proportional to the input voltage. Hence ADC provides a link between the analog world of transducers and the digital world of signal processes and data handling.

Types of ADC:

A. Flash ADC.
B. Sigma-delta ADC.

C. Dual slope converter.

D. Successive approximation converter.

A. Flash Type ADC:

The fastest ADC is the flash type ADC.

Its consist

1. parallel A/D combinations of comparators"
2. Uses a series of comparators.
3. Three-bit flash ADC requires seven comparators.

Disadvantages of flash type ADC:

1. Needs many parts (255 comparators for 8-bit ADC)
2. Lower resolution
3. Expensive
4. Large power consumption.

Application:

The very high sample rate of this type of ADC enable GHz applications like radar detection, wide band radio receivers, electronic test equipment, and optical communication links. More often the flash ADC is embedded in a large IC containing many digital decoding functions.

B. Successive Approximation ADC:

A successive approximation ADC is a type of analog to digital converter that converts a continuous analog waveform into a discrete digital representation via a binary search through all possible quantization levels before finally converging upon a digital output for each conversion.

C. Sigma delta Type ADC :

The design of delta-sigma (DS) analog to digital converters is approximately three-quarters digital and one-quarter analog. ADCs are now ideal

Advantages:

1. High resolution
2. No precision external components needed

Disadvantages:

1. Slow due to oversampling.

D. Dual Slope converter :

1. The sampled signal charges a capacitor for a fixed amount of time
2. By integrating over time, noise integrates out of the conversion.
3. Then the ADC discharges the capacitor at a fixed rate while a counter counts the ADC's output bits. A longer discharge time results in a higher count.

Advantages:

1. Input signal is averaged.
2. Greater noise immunity than other ADC types.
3. High accuracy.

Disadvantages:

1. Slow as compared to other ADC's.
2. High precision external components required to achieve accuracy.

3.Study of average sampling techniques:

Sampling is the process of recording the values of a signal at given points in time. For A/D converters, these points in time are equidistant. The number of samples taken during one second is called the sample rate. These samples are still analogue values. The mathematic description of the ideal sampling is the multiplication of the signal with a sequence of direct pulses. In real A/D converters the sampling is carried out by a sample-and-hold buffer. The sample-and-hold buffer splits the sample period in a sample time and a hold time. In case of a voltage being sampled, a capacitor is switched to the input line during the sample time. During the hold time it is detached from the line and keeps its voltage.

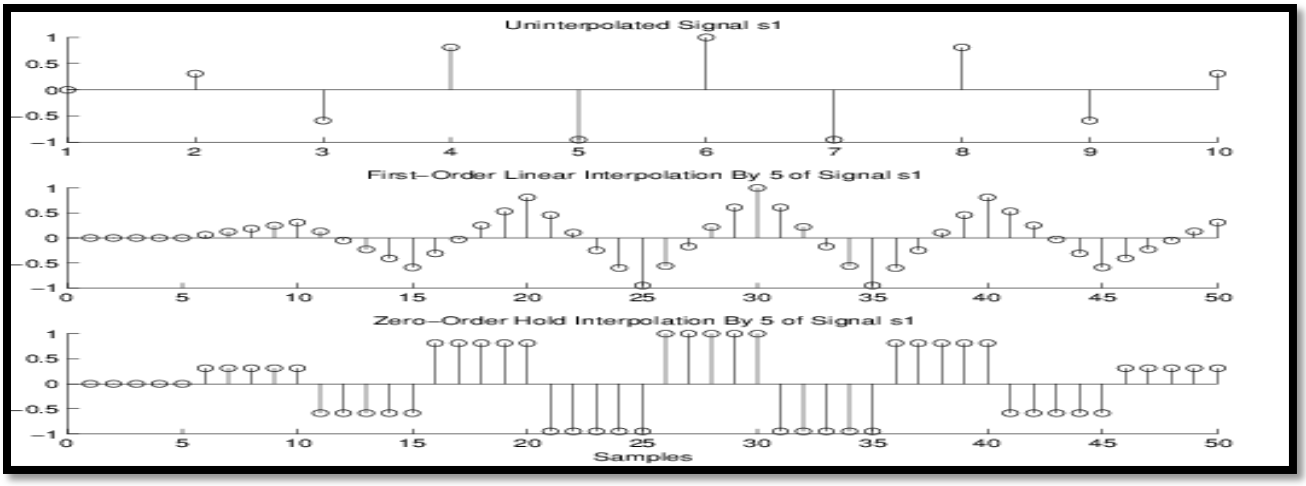

Fig.4. Sampling techniques

4.Study of Real Time Clock:

A real-time clock (RTC) is a computer clock (most often in the form of an integrated circuit) that keeps track of the current time. Although the term often refers to the devices in personal computers, servers and embedded systems, RTCs are present in almost any electronic device which needs to keep accurate time.

What is an RTC?

A real time clock is basically just like a watch - it runs on a battery and keeps time for you even when there is a power outage! Using an RTC, you can keep track of long timelines, even if you reprogram your microcontroller or disconnect it from USB or a power plug. The RTC module maintains time and date information independent of DSP operation. The RTC achieves independent operation by using a separate external clock and power source from the DSP.

The RTC tracks time in the following formats:

- Seconds (0–59)
- Minutes (0–59)
- Hours (0–23)
- Days of the week (1–7)
- Days of the month (1–31)

• Months (1–12)

• Years with leap year correction (0–99)

5.Study of CAN transceiver MCP 2551

CAN Transceiver Features:

a) Supports 1 Mb/s operation.
b) Implements ISO-11898 standard physical layer requirements.
c) Suitable for 12V and 24V systems.
d) Power-on reset protection.
e) Low current standby operation.
f) Protection against damage due to short-circuit conditions (+\- battery voltage).
g) Protection against high-voltage transients.
h) Automatic thermal shutdown protection.
i) Up to 112 nodes can be connected.
j) High noise immunity due to differential bus implementation.
k) Temperature ranges: - Industrial (I): -40°C to +85°C - Extended (E): -40°C to +125°C.

Transmitter Function:

The CAN bus has two states: Dominant and Recessive. A dominant state occurs when the differential voltage between CANH and CANL is greater than a defined voltage (e.g.1.2V). A recessive state occurs when the differential voltage is less than a defined voltage (typically 0V). The dominant and recessive states correspond to the low and high state of the TXD input pin, respectively. However, a dominant state initiated by another CAN node will override a recessive state on the CAN bus.

Receiver Function:

The RXD output pin reflects the differential bus voltage between CANH and CANL. The low and high states of the RXD output pin correspond to the dominant and recessive states of the CAN bus, respectively.

Terminating resister is used CAN transmitter and receiver to reduce impedance, noise in wires, prevents reflections and holds the recessive state.

6.Study of PIC18F458 CAN engine

In PIC18f458 CAN engine is present internally. We are under process to mention detail of that. RS232: It is used for serial communication. The processed data directly transmit to PC using RS232 cable.

CHAPTER 2
LITERATURE REVIEW

1. Background/ Literature view:

A vehicle was generally built with an analog driver-vehicle interface for indicating various parameters of vehicle status like temperature, pressure and speed etc.

Data acquisition is one of the best tools to increase the understanding of vehicle behavior. One can get tons of information just from a couple of potentiometers and accelerometers connected to a simple data logger. However as one add more and more sensors a number of problems arise.

First, the number of cables and connectors increase to where it becomes both a logistical and economical issue. With 100 connectors instead of 10, the risk of one failing is ten times as big; reliability thus becomes an issue. In the same way, troubleshooting a faulty cable or connector in a large wire harness becomes very time consuming. Sending analog or frequency signals through un-shielded cables can also result in signal disturbance coming from other systems on the vehicle. Fortunately there are methods with which these problems can be avoided. The common denominator for these methods is that data is sent digitally in a network. The network most commonly used in automotive applications is the CAN network (Controller-Area Network).

Bosch originally developed the Controller Area Network (CAN) in 1985 for in-vehicle networks. In the past, automotive manufacturers connected electronic devices in vehicles using point-to-point wiring systems. Manufacturers began using more and more electronics in vehicles, which resulted in bulky wire harnesses that were heavy and expensive. They then replaced dedicated wiring with in-vehicle networks, which reduced wiring cost, complexity, and weight. CAN, a high-integrity serial bus system for networking intelligent devices, emerged as the standard in-vehicle network.

The automotive industry quickly adopted CAN and, in 1993, it became the international standard known as ISO 11898. Since 1994, several higher-level protocols have been standardized on CAN, The hardware structure mainly integrates the CAN bus controller, ARM as the main control module, LCD display.