

Control of Braking System by Using UART and PIC Microcontroller

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Abstract- The main purpose of present Automobiles is being developed by more of electrical parts for efficient operation. Generally a vehicle was manufactured with an analog driver-vehicle interface for indicating various vehicle statuses like speed, fuel level, Engine temperature etc., This work presents the development and implementation of a digital driving system for a semi-autonomous vehicle to improve the efficiency of driver-vehicle interface. It uses a PIC based data acquisition system that uses ADC to control data from analog to digital format and visualize through LCD. This work focuses the development of distance measurement by using Ultrasonic sensors which denotes that vehicle's position from obstacles. The vehicle detects the speed breaker and also some primary zones before certain limitation by tags using UART module for introducing the new invention of priority based Intelligent Braking System (IBS).

Index Terms- IBS, LCD, PIC, ADC, UART

I. INTRODUCTION

A system is a form of working, organizing or performing one or many tasks based on a fixed plan, program, or set of rules. A system is a model in which all its units are arranged and are made to work together according to the plan or program. The important hardware parts includes status display panel, switches and dials for user-defined programming, a motor to rotate or spin its power supply and control unit. A computer is a structure that has the following components.

1. A microprocessor.
2. A large memory consists the following two kinds:
 - a.Primary memory - semiconductor memories - RAM, ROM and reliable accessible caches
 - b.Secondary memory - magnetic memory situated in hard disks, diskettes and cartridge tapes and optical memory in CD-ROM
3. Input units consists keyboard, mouse, digitizer, scanner, etc.
4. Output units like video monitor, printer, etc.
5. Networking units has Ethernet card, front-end processor-based drivers, etc.
6. I/O units like a modem, fax cum modem, etc.

A real time operating system (RTOS) is the one that supervise the application software and provides a mechanism to make the processor to run a process according to the scheduling and do the context-switch between the various processes

(tasks). RTOS explains the way the system works and it organizes control to a resource in sequence of the series of tasks of the system.

An embedded system is defined as the computer with hardware with software embedded in it as one of its most important component. It is a well-known computer-based system for an applications or product. It may be either an independent system or part of any larger system. It makes access to a resource in sequence of the series of tasks of the system. It arranges their working and execution by following a plan to determine the latencies and to meet the deadlines. Latency is given as the waiting period between running the codes of a task and the moment at which the need for the task arises. It contains a set of rules that are used during the execution of the application software, whereas the small-scale embedded system doesn't need an RTOS.

2. UART

An UART is Universal Asynchronous Receiver/Transmitter has an individual (or part of an) integrated circuit that is given for serial communications over a computer or peripheral device serial port. UARTs are frequently included in microcontrollers. An UART has the microchip with programming that controls a computer's interconnection to its attached serial devices.

➤ Converts the bytes that are received from the computer with the parallel circuits are given into a single serial bit stream for outbound transmission.

- In inbound transmission, converts the serial bit stream into the bytes that are used for the computer handling.
- Adds a parity bit that is been selected on outbound transmissions and analyses the parity of incoming bytes and eliminates the parity bit.
- Adds up start and stop delineators on outbound and separates them from inbound transmissions.
- Handles interrupts from the keyboard and mouse that are serial devices with special ports.
- May handle other types of interrupt and device management that are in need of coordinating the computer's speed of operation with device speeds.

3. STRUCTURE OF UART

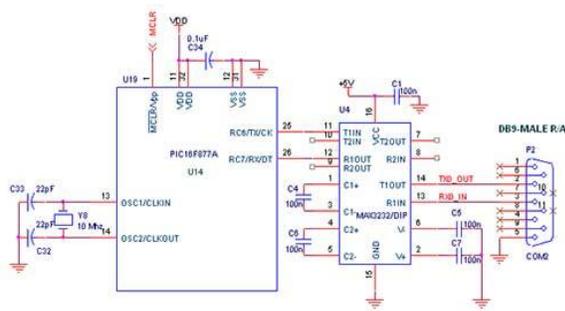


Figure 1: Circuit Diagram to Interface UART with PIC16f877a

- A UART contains the following equipments:
- A clock generator has a multiple of the bit rate to allow sampling in the center region of a bit period.
- Input as well as output shift registers.
- Transmit/receive control.
- Read/Write control logic.
- Transmit or receive buffers (optional).
- Parallel data bus buffer (optional).
- First-in, first-out (FIFO) buffer memory (optional).

4. BLOCK DIAGRAM:

In this block diagram there are four parameters such as Temperature sensor, Smoke sensor and Obstacle sensor. These sensors are made in interact with the microcontroller and Data transfer through the UART. Power supply gives to the PIC microcontroller and every sensor as per the requirement.

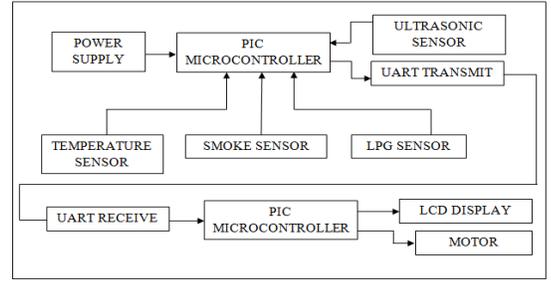


Figure 2: Block Diagram of Process

These sensors continuously receive the information and send the information to the PIC microcontroller. If hazardous condition occurs then microcontroller controls it automatically. A vehicle is generally built with an analog driver vehicle interface that indicates various parameters of vehicle status like temperature, pressure and speed etc. To improve the driver-vehicle interface, a two way responding digital system is designed. A microcontroller based data acquisition system that uses ADC to take all control data from analog to digital format is used. Since the vehicle information systems are extended over the body of the vehicle used, a communication module that supports to provide a one halt control of the vehicle by means of the master controller of the digital driving system. Accident prevention is one of the most important areas of research today. Our paper is designed to stop/control accidents caused by loss of control, drunken driving and rash driving, by means of circuitry aided by a microcontroller kit. In Fig 2 our work, braking distance and the distance of the hurdle are taken into consideration along with the speed of the vehicle. The speed of motion of the vehicle and the distance of the object in front are analyzed by means of the ultrasonic sensor. These sensors give real time inputs to the microcontroller coding. Using the Hall sensor the system will analyze the speed of the vehicle with the microcontroller, the distance required to bring the vehicle to a complete stop for that speed is been calculated. Braking motors are included to activate the brakes thereby attaining automatic braking procedures. The system helps in coincidence with the driver judgment if the driver doesn't sense the obstacle and applies the brake at the right time then the microcontroller initiates braking motor to reduce speed automatically, if driver will not taken an action for a particular. Our future work deals with incorporating real time brake shoe wear system to provide enhanced feature for the intelligent braking system.

Aware of safety in terms of avoiding accidents in the first place and then protecting occupants when a crash is unavoidable, we can avoid more accidents, save more lives, and reduce insurance and medical costs to society. Intelligent Braking System approach provides a significant shift from the traditional approach to safety, but it is necessary to achieve the substantial benefits.

5. SIMULATION RESULTS

Proteus, PROcessor for TExt Easy to USE, is known as a fully functional, procedure based programming language created in 1998 by Simone Zanella, is used to predict the results

and the simulation is performed. The results obtained are given as follows.

H-Low Distance; G-Distance Normal

6. CONCLUSION

The work introduces an embedded system with a combination of UART bus systems. Digital control of the vehicle is an important reference of modern technology. With the high-speed development of embedded technology, high-performance embedded processor is perforated into the auto industry, that is of low cost, high reliability and other features to meet the requirements of the modern automobile industry. The presented high-speed UART bus system solves the problem of automotive system applications, also has an exact practical value and significance.

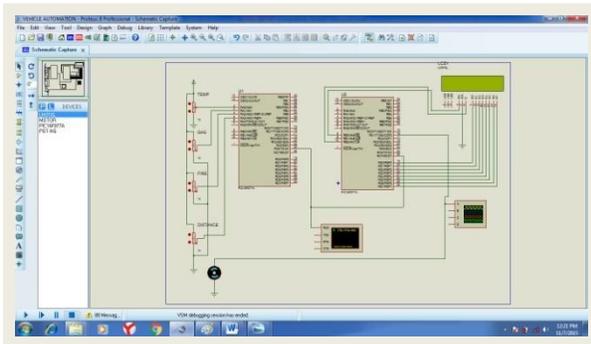


Figure 3: Simulation Block Diagram of the Proposed Architecture

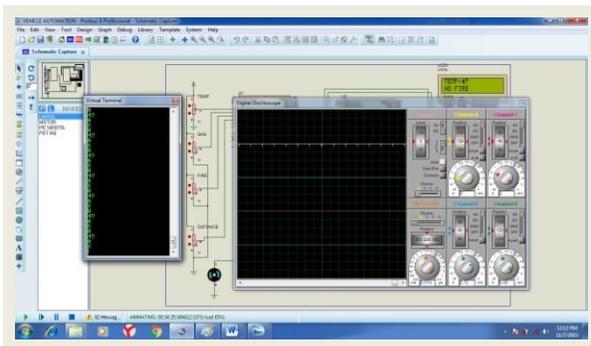


Figure 4: Simulation Block Diagram without Speed Controlled

A-No Gas Leakage; B-Normal Gas Leakage; C-High Gas Leakage; D-Fire Detected; E-No fire Detected; H-Low Distance; G-Distance Normal

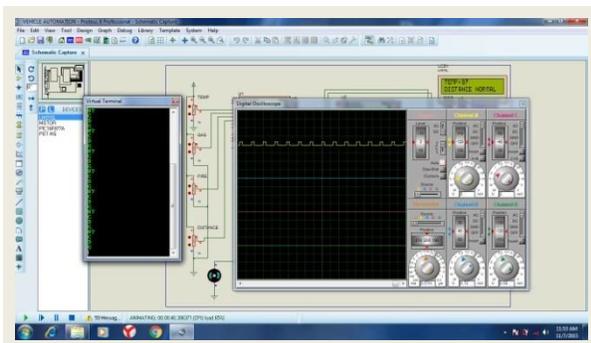


Figure 5: Simulation Block Diagram With Speed Controlled

A-No Gas Leakage; B-Normal Gas Leakage; C-High Gas Leakage; D-Fire Detected; E-No fire Detected;

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