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COLLISION PREVENTION FOR TRAINS USING ULTRASONIC SENSOR

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ABSTRACT

It is necessary to have an intelligent system which identifies the accident before it happens and informs a driver to be alert or to regulate the speed of the train. This can be implemented by connecting Ultrasonic Sensors in front of the vehicles. The Ultrasonic sensors will give the distance between the present train and the train which is coming in the opposite direction. The distance is constantly monitored by a microcontroller and when the distance is close, it signals the driver to stop the train or it can be programmed to stop the train if the train is fully automated For paper Demonstration we have implemented a small model with a single sensor fixed in it. The same operation is Done for all the trains. Since our project is related to the train, in addition the the mentioned aim we can also monitor the Temperature of the Train. The Temperature is measured by using the thermistor by connecting it to an ADC of PIC Microcontroller.

Keywords— Ultrasonic sensor, 8bitmicrocontrollerAT89S52, AC performance,thermistor.

1. Introduction

AGV or Automatic Guided Vehicle concept is very much dominant nowadays due to the advancement of science and technology. It not only emphasizes on the need to safe lane driving but also on the improvement of human race in every aspect of life to make his living more comfortable one. We use intelligent instruments in every part of our lives. It won't take much time that we realize that most of our tasks are being done by electronics. Very soon, as we shall see, they will perform one of the most complicated tasks that a person does in a day, that of driving a vehicle. Within the framework of automation, increasingly powerful and flexible systems are needed in the field of industrial sensors and actuators. The basic concept of open systems is to enable an exchange of information between application functions implemented on hardware from a diversity of manufacturers. These functions include defined application functions, a standard user interface for communications and a standard transmission medium. We are to design a microcontroller based hardware module which is capable of detecting the other vehicles in its path and thereby altering or regulating its speed based upon the variables obtained. Over heat of the engine etc., then the vehicle which has the designed hardware module in it regulate its speed and to raise an alarm and even applies brakes or stops momentarily. For

this sense, the PIC microcontroller is programmed to monitor the Engine Temperature and also the Fuel level of the vehicle. For this purpose Thermistor and IRE (Infra Red Emitter) and an IRD (Infra Red Detector) is also used in the hardware module.

II. DESIGN

Smart cooling fan circuit design uses four major components – a Microcontroller, Fan, Air conditioning, LCD. Here AT89C52 microcontroller is used and it is an 8-bit controller. This controller requires a supply voltage of +5V DC. In order to provide regulated 5V DC voltage to the controller we need to use 7805 power supply circuit. We can use 9V DC battery or 12V, 1A adaptor as a power source.

Reset Circuit Design: The reset pin of the microcontroller is kept active till the power supply is in the specified range and a minimum oscillation level is maintained. In other words to ensure the supply voltage does not falls below the threshold level of 1.2V and the reset pulse width is greater than 100ms (recommended for 89C51). we select the values of resistor and capacitor such that RC >=100ms. Here we select a 10K resistor and a 10uF electrolyte capacitor.

Oscillator Circuit Design: A crystal oscillator is used to provide external clock signal to the microcontroller. To ensure smooth operation, we connect two ceramic capacitors ranges from 20pF to 40pF. This crystal oscillator is connected between pin 18 and 19 of the microcontroller.

The transduction element is driver by four paired CMOS buffers. The output stage is actually a full bridge which causes a doubling of the effective voltage across the element. Capacitor C1 blocks the DC components of the output signal during pauses in emission. To obtain bursts at maximum energy, IC1 is connected direct to the 9 volt battery. The remained of the circuit operates from 5V. The 40 KHz oscillator is tuned to the resonance frequency of the transducers with the aid of P1. The regulated supply voltage ensures adequate frequency stability. Comparator A6 matches the logic levels of the oscillator (high =5V) and the output circuit (high =9V)

The 5-voltsupply is regulated by a 78L05. This type of regulator requires only a small bias current at low output currents and thus helps to keep the overall current drawn by the circuit low (typ.4.5 mA). Unfortunately the load regulation of this regulator is poor good decoupling, particularly of the counter IC (R19 C13) is therefore essential.

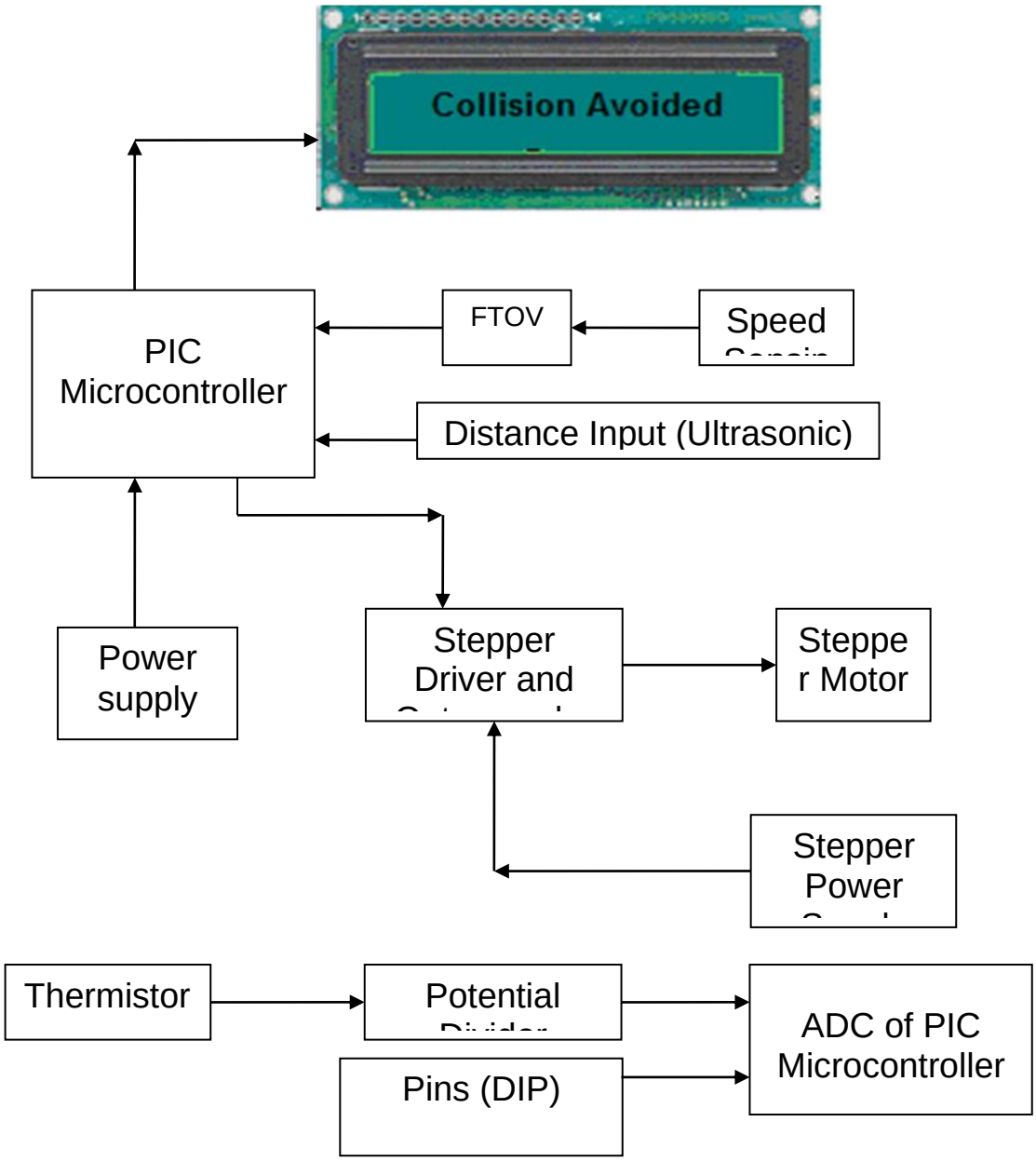
If the unit is used in noisy surroundings reduce its sensitivity even further so that it does not respond to spurious sounds. Note, however that the maximum measurable distance is then reduced. It should be borne in mind that absorbent surfaces such as furniture, dressed people, and so on can not or at least not reliably be detected. This is because the echo from them is too weak to trigger the receiver. It pays however to experiment. For distance the sensitivity of the receiver may be increased (within reason) by reducing the value of R6. Further some the time dependency of the sensitivity may be altered by changing the value of time constant R6-C8. Reducing that value makes the meter more sensitive over shorter distances.

III. Circuit Description

We are to design a microcontroller based hardware module which is capable of detecting the other vehicles in its path and thereby altering or regulating its speed based upon the variables obtained.

PORTE has three pins (RE0/RD/AN5, RE1/WR/AN6,and RE2/CS/AN7) which are individually configureable as inputs or outputs. These pins have Schmitt Trigger input buffers.The PORTE pins become the I/O control inputs for the microprocessor port when bit PSPMODE (TRISE<4>) is set. In this mode, the user must make certain that the TRISE<2:0> bits are set, and that

the pins are configured as digital inputs. Also ensure that ADCON1 is configured for digital I/O. In this mode, the input buffers are TTL.



Pin Configuration:

1. Vcc: The vcc pin was connected to the + 5V DC
2. Trigg: When a valid trigger signal is applied, it generates 8 pulses of 40 KHz..
3. GND: Gnd pin is connected to the ground.

Lcd working:

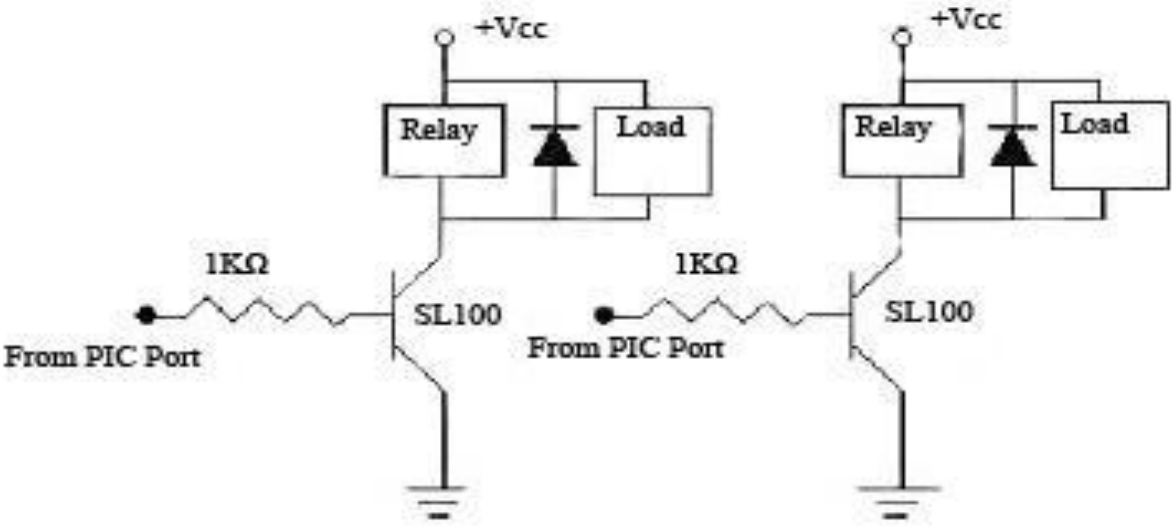
The lcd is used to display the values or temperature ranges. On the construction of LCD the reflected mirror is placed at the back. The term LCD is a Liquid Crystal Display.

AT89S52 Microcontroller Features:

• A CPU (Central Processing Unit) 8 Bit.
• 256 bytes of RAM (Random Access Memory) internally.
• Four-port I / O, which each consist of eight bits
• the internal oscillator and timing circuits.
• Two timer / counters 16 bits
• Five interrupt lines (two fruits and three external interrupt internal interruptions).
• A serial port with full duplex UART (Universal Asynchronous Receiver Transmitter).
• Able to conduct the process of multiplication, division, and Boolean.
• the size of 8 K Byte EPROM for program memory.
• Maximum speed execution of instructions per cycle is 0.5 s at 24 MHz clock frequency.
If the microcontroller clock frequency used is 12 MHz, the speed is 1 s instruction Execution.

PIN DIAGRAM:

Diagram above shows the pin configuration of the AT89S52, where the function of each pin is written next to it, and, if it exists, the dual function is written between brackets. Note that the pins that have dual functions can still be used normally as an input/output pin. Unless the program uses their dual functions, all the 32 I/O pins of the microcontroller are configured as input/output pins.



Relays are electromagnetic switches, which provide contact between two mechanical elements. Relays have a coil which works on 12V dc power supply and provides DPDT action as an output. In general relays provide potential free contacts which can be used for universal function like DC, AC voltage switching and to control bigger electrical switch gears.

The electromechanical relays are based on the comparison between operating torque/force and restraining Torque/force. The VA burden of such relays is high. The characteristics of these relays have some limitations. Each relay can perform only one protective function. Such relays are used for simple and less costly protection purposes. For important and costly equipment installation static relays are preferred. Protective relaying is necessary for almost every electrical plant and no part of the power system is left unprotected.

The choice of protection depends upon several aspects such as

- Type and rating of the protected Equipment.
- Its importance.
- Location and cost.

- Probable abnormal conditions between
  Generators and final load points.

There are several electrical equipments and machines of various ratings. Each needs certain adequate protection. The protective relaying senses the abnormal conditions in a part of the power system and isolates that part from the healthy part of system.

The relays used in this project are compact, self-contained devices which respond to abnormal conditions (relays can distinguish normal and abnormal conditions). It has already been said that PIC16F877A has a RISC architecture. This term is often found in computer literature, and it needs to be explained here in more detail. Harvard architecture is a newer concept than von-Neumann's. It rose out of the need to speed up the work of a microcontroller. In Harvard architecture, data bus and address bus are separate.

Thus a greater flow of data is possible through the central processing unit, and of course, a greater speed of work. Separating a program from data memory makes it further possible for instructions not to have to be 8-bit words. PIC16F877A uses 14 bits for instructions which allows for all instructions to be one word instructions. It is also typical for Harvard architecture to have fewer instructions than von-Neumann's, and to have instructions usually executed in one cycle. Microcontrollers with Harvard architecture are also called "RISC microcontrollers". RISC stands for Reduced Instruction Set Computer. Microcontrollers with von-Neumann's architecture are called 'CISC microcontrollers. Title CISC stands for Complex Instruction Set Computer. Since PIC16F877A is a RISC microcontroller, that means that it has a reduced set of instructions, more precisely 35 instructions. (Ex. Intel's and Motorola's microcontrollers have over hundred instructions)
All of these instructions are executed in one cycle except for jump and branch instructions. According to what its maker says, PIC16F84 usually reaches results of 2:1 in code compression and 4:1 in speed in relation to other 8-bit

We are using temperature sensor to measure the room temperature and working according to the temperature. Here now, we use 3 led to mention the smart cooling fan operation If the temperature is of low degree celsius, led 1 will be in on conditions, while the other led's are off conditions. If the temperature is of normal degree celsius, led 2 will be in on conditions, while the other led's are off conditions. If the temperature is of high degree celsius, led 3 will be in on conditions, while the other led's are off conditions.

RESULT:

The main objective of our model is to regulate smooth flow of traffic in areas which is highly prone to accidents. Due to the enhancement and real time application of such a model, COLLISION OF TRAINS would be AVOIDED to a greater extent. It features with Ultrasonic sensor for obstacle detection and an excellent artificial intelligence circuitry. We have successfully incorporated all the above functions in our model and as a model for the real time application it has capability to perform these operations for demonstrations only.

CONCLUSION AND FUTURE WORK:

In summary, the microcontroller based smart cooling fan is used for sudden cooling. In future we can use the gesture to operate the fan with ac project.

- We can use this model further in real vehicles if we implement the same procedure to drive the wheels of the vehicle.
- High resolution , continuous monitory and easy start process
- Can gather sensitive information while traveling, and can request the Microcontroller for further enhancements.

- Furthermore we can connect a Camera in the front of the vehicle to continuously monitor the track in which it is traveling and we can also code the microcontroller to change tracks in case of any obstruction in the front.

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