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Ultrasonic Technique to reduce the Accident

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Abstract: ***The purpose of the project is to design and develop an "ultrasonic powered guiding blind stick for visually impaired and blind persons". The idea is to design and prepare a ultrasonic sensor based device which can be handheld or attached to the stick combining the property of sound monitoring for blind and vibration alert mechanism for people who are both blind and deaf. The overall aim of this project is to provide a cost effective electronic guiding mechanism for blind, whose output is in the form of voice.***

Key terms- Ultrasonic object detector,

I. INTRODUCTION

Vision is the most important part of human physiology as 83% of information human being gets from the environment is via sight. The 2011 statistics by the World Health Organization (WHO) estimates that there are 285 billion people in world with visual impairment, 39 billion of which are blind and 246 with low vision. The traditional and oldest mobility aids for persons with visual impairments are the walking cane (also called white cane or stick) and guide dogs. The most important drawbacks of these aids are necessary skills and training phase, range of motion and very little information conveyed. With the rapid advances of modern technology, both in hardware and software front have brought potential to provide intelligent navigation capabilities.

Recently there has been a lot of Electronic Travel Aids (ETA) designed and devised to help the blind navigate independently and safely. Also high-end technological solutions have been introduced recently to help blind persons navigate independently. Many blind guidance systems use ultrasound because of its immunity to the environmental noise. Another reason why ultrasonic is popular is that the technology is relatively inexpensive, and also ultrasound emitters and detectors are small enough to be carried without the need for complex circuit.

Furthermore, many blind and visually impaired people are elderly and find it difficult to communicate appropriately with another living being. Also (GPS) based voice alert system for the blind uses the current location and gives the alert to the blind person if it was his destination area.The main objective of this proj is to provide artificial guidance to the visually impaired people with the help of an P89V51RD2,Ultrasonic Sensors, a speaker physically mounted on a stick. In order to achieve the goal of this project the work has been categorized as follows:

1. Overall block diagram.
2. Study of microcontroller P89V51RD2.
3. Study of Ultrasonic Sensors.
4. Study of DC motor to get vibrations.
5. Recording of voice message to alert the Blind Person.
6. Designing of the stick.

The significance of this project is to help the visually impaired people with appropriate voice Commands that are played through the speaker. The paper proposed the design and architecture of a new concept of Smart Electronic Guiding Stick for blind people. The advantage of the system lies in the fact that it can prove to be very Low cost solution to millions of blind person worldwide.

II. BLOCK DIAGRAM

Fig shown below consists of following- microcontroller (P89V51RD2), ultrasonic sensor, dc-motor, LCD display, voice recording and playback device (ARP9600) details of which are discussed below.

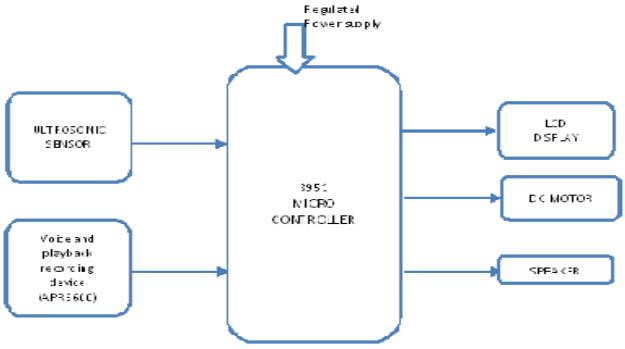

Fig 1: project design overview.

III. MICROCONTROLLER PHILLIPS 89V51RD2.

1. General description

The P89V51RB2/RC2/RD2 are 80C51 microcontrollers with 16/32/64 kB flash and 1024 B of data RAM. A key feature of the P89V51RB2/RC2/RD2 is its X2 mode option. The design engineer can choose to run the application with the conventional 80C51 clock rate (12 clocks per machine cycle) or select the X2 mode (six clocks per machine cycle) to achieve twice the throughput at the same clock frequency. Another way to benefit from this feature is to keep the same performance by reducing the clock frequency by half, thus dramatically reducing the EMI. The flash program memory supports both parallel programming and in serial ISP. Parallel programming mode offers gang-programming at high speed, reducing programming costs and time to market. ISP allows a device to be reprogrammed in the end product under software control. The capability to field/update the application firmware makes a wide range of applications possible.

The P89V51RB2/RC2/RD2 is also capable of IAP, allowing the flash program memory to be reconfigured even while the application is running.

2. Features

- 80C51 CPU
- 5 V operating voltage from 0 MHz to 40 MHz
- 16/32/64 kB of on-chip flash user code memory with ISP and IAP
- Supports 12-clock (default) or 6-clock mode selection via software or ISP
- SPI and enhanced UART
- PCA with PWM and capture/compare functions
- Four 8-bit I/O ports with three high-current port 1 pins (16 mA each)
- Three 16-bit timers/counters
- Programmable watchdog timer
- Eight interrupt sources with four priority levels
- Second DPTR register
- Low EMI mode (ALE inhibit)
- TTL- and CMOS-compatible logic levels
- Brownout detection
- Low power modes
- Power-down mode with external interrupt wake-up
- Idle mode
- DIP40, PLCC44 and TQFP44 packages.

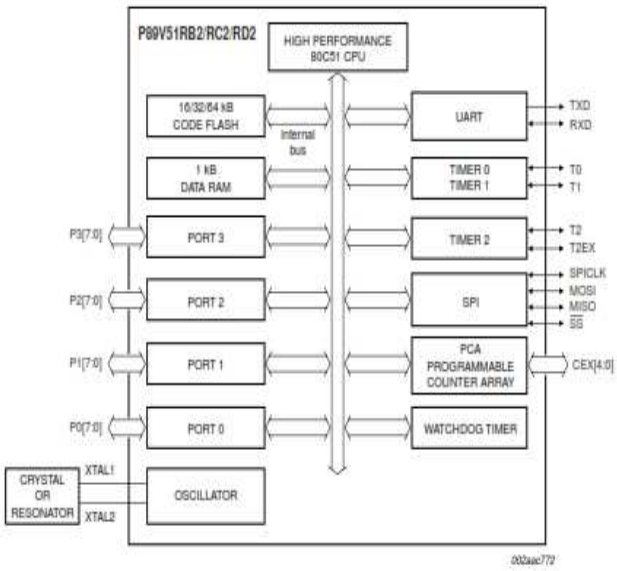

Fig 2: block diagram of P89V51RD2.

Flash program memory bank selection

There are two internal flash memory blocks in the device. Block 0 has 16/32/64 kB and is organized as 128/256/512 sectors, each sector consists of 128 B. Block 1 contains the IAP/ISP routines and may be enabled such that it overlays the first 8 kB of the user code memory. The overlay function is controlled by the combination of the Software Reset Bit (SWR) at FCF.1 and the Bank Select Bit (BSEL) at FCF.0. The combination of these bits and the memory source used for instructions is shown in Table 1.

SWR (FCF.1)	BSEL (FCF.0)	Addresses from 0000H to 1FFFH	Addresses above 1FFFH
0	0	bootcode (in block 1)	user code (in block 0)
0	1	user code (in block 0)	
1	0		
1	1		

Table 1. Code memory bank selection

IV.ULTRASONICSENSOR.

Product features:
Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:
(1) Using IO trigger for at least 10us high level signal,
(2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
(3) IF the signal back, through high level, time of high output IO duration is the time from sending ultrasonic to returning. Test distance = (high level time×velocity of sound (340M/S) / 2.

Fig 3: ultrasonic sensor.

Timing diagram:
The Timing diagram is shown below. You only need to supply a short 10uS pulse to the trigger input to start the ranging, and then the module will send out an 8 cycle burst of ultrasound at 40 kHz and raise its echo. The Echo is a distance object that is pulse width and the range in proportion .You can calculate the range through the time interval between sending trigger signal and receiving echo signal. Formula: us / 58 = centimeters or us / 148 =inch; or: the range = high level time * velocity (340M/S) / 2; we suggest to use over 60ms measurement cycle, in order to prevent trigger signal to the echo signal.

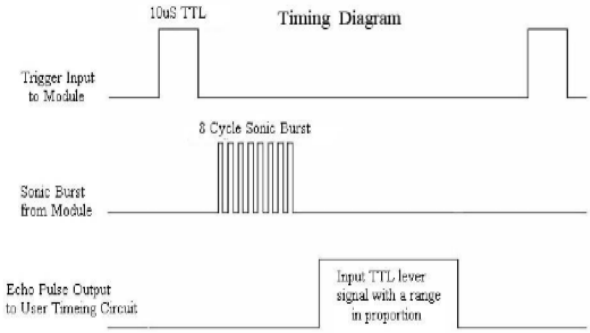

Fig. 4: Timing Diagram

The module is not suggested to connect directly to electric, if connected electric, the GND terminal should be connected the module first, otherwise, it will affect the normal work of the module. When tested objects, the range of area is n□ ot less than 0.5 square meters and the plane requests as smooth as possible, otherwise, it will affect the results of measuring.

DC MOTOR, DRIVER CIRCUITS

Here the driver circuits are used to control the operations of firing unit, laser unit & audio reception unit present on the robotic module. Here three types of driver circuits are used they are ground driver, laser driver and motor driver circuit.

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors. We have used this driver circuit too drive the motors of the robot. Each L293D is used to drive two motors.

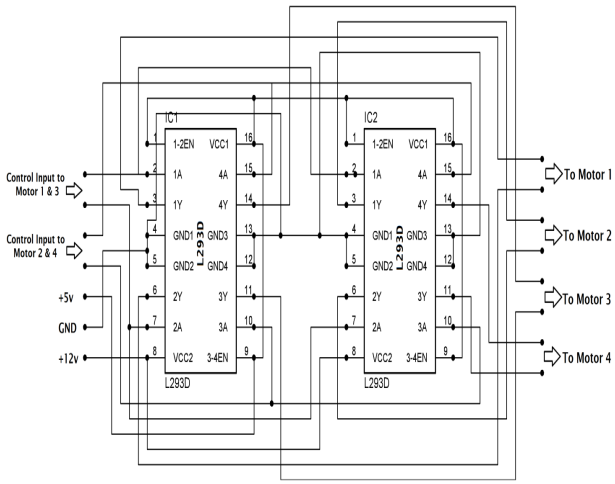

Fig. 5: Motor Driver Circuit

Two L293D's are used to drive four motors. When both the inputs are low the motor will be in the halt state, when the first input is high and the second input is low the motor will move in the forward direction, when first input is low and second input is high the motor will move in the reverse direction and when both the inputs are low the motor will be in the halt state.

MOTORS

NR-DC-ECO is high quality low cost DC geared motor. It contains Brass gears and steel pinions to ensure longer life and better wear and tear properties. The gears are fixed on hardened steel spindles polished to a mirror finish. These spindles rotate between bronze plates which ensures silent running. The output shaft rotates in a sintered bushing. The whole assembly is covered with a plastic ring. All the bearings are permanently lubricated and therefore require no maintenance. The motor is screwed to the gear box from inside.

Fig. 6: 12v 100 rpm DC Geared Motor

V. VOICE RECORDING AND PLAYBACK.

APR9600 multi-section sound recorder/replay ICAPR9600 multi-section sound recorder/replay IC and experimental board and experimental board

APR9600 is a low-cost high performance sound record/replay IC incorporating flash analogue storage technique. Recorded sound is retained even after power supply is removed from the module. The replayed sound exhibits high quality with a low noise level. Sampling rate for a 60 second recording period is 4.2 kHz that gives a sound record/replay bandwidth of 20Hz to 2.1 kHz. However, by changing an oscillation resistor, a sampling rate as high as 8.0 kHz can be achieved.
This shortens the total length of sound recording to 32 seconds.
Total sound recording time can be varied from 32 seconds to 60 seconds by changing the value of a single resistor.

During sound replaying, the IC's control circuit reads analogue data from flash RAMs. The signal then passes through a low-pass filter, a power amplifier and output to an 8 to 16 Ohm speaker. There are different sound recording and replaying modes (see Table 2). These modes are selected using MSEL1 (Pin 24), MSEL2 (Pin 25) and –M8 (Pin 9). –M1 to –M7 keys have different functions in different modes.

Record sound tracks
This is an example of recording 8 sound tracks. The mode switch should have the following pattern: MSEL1=1(switched to left-hand side of the mode selection switch), MSEL2=1 (left-hand side). –M8=1 (left-hand side). RE=0 (right-hand side). The maximum length of the 8 tracks is 7.5 seconds. Press –M1 continuously and you will see BUZY LED illuminates. You can now speak to the microphone. Recording will terminate if –M1 is released or if the recording time exceeds 7.5 seconds. Similarly, press –M2 to -M8 to record other sound tracks.

Replay sound tracks
Now make RE=1 (switched to Left-hand side of the mode selection switch) while keep other switches at the same location. Toggle –M1 to –M8 (press key and release) causes a particular sound track to replay once. While the sound is playing, press the same key again or press CE key will terminate the current sound track. Press other key while a sound is being played causes a new sound track to be played.
If a key from –M1 to -M8 is pressed continuously, the particular sound track will be played continuously. Press CE to stop playing the sound track.

Record sound tracks sequentially
This is an example of recording sequential sound tracks. The mode switch should have the following pattern: MSEL1=0(switched to right-hand side of the mode selection switch), MSEL2=0 (right-hand side). –M8=1 (left-hand side). RE=0 (right-hand side). Press CE first to reset the sound track counter to zero. Press and hold –M1 down and you will see BUZY LED illuminates. You can now speak to the microphone. Recording will terminate if –M1 is released or if the recording time exceeds 60

VI. CONCLUSION.

An intelligent ultrasonic guiding stick is developed in this project, which helps the visually impaired as well as deaf to move around without depending on others help constantly.
The advantage of this project lies in the fact that, it can prove to be a low cost solution to billions of blind around the world.

VII. REFERENCES

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