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A SMART SOUND TRACKING DEVICE

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Abstract*: *In this project, we propose a system for reliable detection of the direction of the audio source. Compared with previous researches, the system comprises simpler, faster and more accurate algorithm and a threshold level setting mode to make the system immune to external noise.The main objective of this project is to detect the sound source,track the direction of audio source and move in that direction.

The sound source is detected using microphones.The microphones sense the sounds upto a pre-defined threshold level.Now,the received signal strengths are compared and the device moves towards the direction of maximum signal strength obtained.This operation is controlled by using a microcontroller.

The next step is to move the device in the maximum signal strength direction.Motors are used in order to move the device in the desired direction.This can be used in security purpose for detecting un-authorized persons.

Keywords—microphone, microcontroller

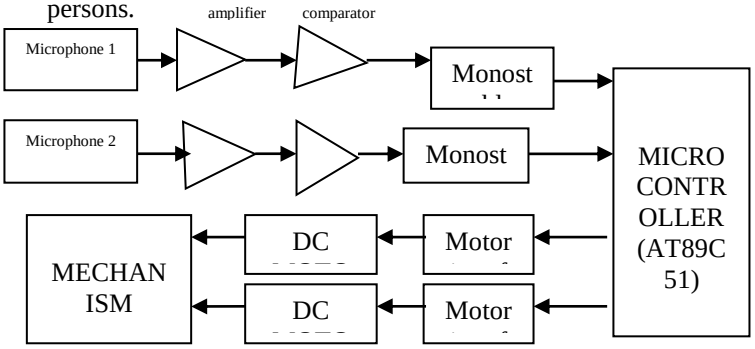
I. INTRODUCTION :

For mobile robots, multiple modalities are important to recognize the environment. Visual sensor is the most popular sensor used today for mobile robots Medioni and Kang (2005).The visual sensor can be used to detect a target and identify its position Huang et al. (2006).However, since a robot generally looks at the external world from a camera, difficulties will occur when a object does not exist in the visual field of the camera or when the lighting is poor.Vision-based robots cannot detect a non-visual event that in many cases with sound emissions.In these situations, the most useful information is provided by auditory sensor. Audition is one of the most important senses used by humans and animals to recognize their environments Heffner and Heffner (1992).Sound localization ability is particularly important.Biological research has revealed that the evolution of the mammalian audible frequency range is related to the need to localize sound, and the evolution of the localization acuity appears to be related to the size of the field of best vision (the central field of vision with high acuity) Heffner and Heffner (1992).Sound localization enables a mammal to direct its field of best vision to a sound source.This ability is important for robots as well.Any robot designed to move around our living space and communicate with humans must also be equipped with an auditory system capable of sound localization.

II. PROJECT DESCRIPITION:

The sound source is detected using microphones.The microphones sense the sounds upto a pre-defined threshold level.Now,the received signal strengths are compared and the device moves towards the direction of maximum signal strength obtained.This operation is controlled by using a microcontroller.

The next step is to move the device in the maximum signal strength direction.Motors are used in order to move the device in the desired direction.This can be used in security purpose for detecting un-authorized persons.



MICROPHONE:

The microphone works as a transducer which converts the audio signal to electrical signal. This arrangement uses minimum number of microphones for reliable detection.

MONOSTABLE MULTIVIBRATOR:

A **multivibrator** is an electronic circuit used to implement a variety of simple two-state systems such as oscillators, timers and flip-flops.It is characterized by two amplifying devices (transistors, electron tubes or other devices) cross-coupled by resistors or capacitors. The name "multivibrator" was initially applied to the free-running oscillator version of the circuit because its output waveform was rich in harmonics. There are three types of multivibrator circuits depending on the circuit operation:

1. Astable
2. Monostable

3. Bistable

L293D MOTOR DRIVER IC:

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC).The l293d can drive small and quiet big motors as well.

DC Motor:

DC motor relies on the fact that like magnet poles repel and unlike magnetic poles attract each other. A coil of wire with a current running through it generates a electromagnetic field aligned with the center of the coil. By switching the current on or off in a coil its magnet field can be switched on or off or by switching the direction of the current in the coil the direction of the generated magnetic field can be switched 180°. A simple *DC* motor typically has a stationary set of magnets in the stator and an armature with a series of two or more windings of wire wrapped in insulated stack slots around iron pole pieces (called stack teeth) with the ends of the wires terminating on a commutator. The armature includes the mounting bearings that keep it in the center of the motor and the power shaft of the motor and the commutator connections. The winding in the armature continues to loop all the way around the armature and uses either single or parallel conductors (wires), and can circle several times around the stack teeth. The total amount of current sent to the coil, the coil's size and what it's wrapped around dictate the strength of the electromagnetic field created. The sequence of turning a particular coil on or off dictates what direction the effective electromagnetic fields are pointed. By turning on and off coils in sequence a rotating magnetic field can be created. These rotating magnetic fields interact with the magnetic fields of the magnets (permanent or electromagnets) in the stationary part of the motor (stator) to create a force on the armature which causes it to rotate. In some DC motor designs the stator fields use electromagnets to create their magnetic fields which allow greater control over the motor. At high power levels, DC motors are almost always cooled using forced air.

MICRO CONTROLLER**:**

AT89C51 is an 8-bit microcontroller and belongs to Atmel's 8051 family. **ATMEL 89C51** has 4KB of Flash programmable and erasable read only memory (PEROM) and 128 bytes of RAM. It can be erased and program to maximum of 1000 times.

Pin Diagram

FEATURES:

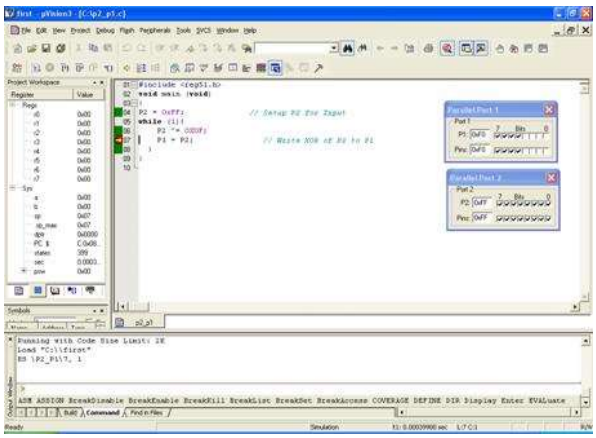
- 256 x 8-Bit Internal RAM.
- 8K Bytes Internal ROM
- 32 Programmable I/O Lines.
- Three 16-bit Timers/Counters.
- Eight Interrupt Sources.
- Programmable Serial Channel.
- Compatible with MCS-51 Products.
- Low Power Idle and Power Down Modes.
- Endurance: 1,000 Write/Erase Cycles.
- Fully Static Operation: 0 Hz to 24 MHz.

COMPARATOR:

A comparator is a gadget that compares voltages and consequently switches to indicate which is larger. Voltage comparators are commonly used in Analog-digital converters. It works by having a standard Op-amp produce the most positive voltage it can when the non-inverting input is higher than the inverting input. If the opposite is true, the Op-amp produces the most negative output it can.

Introduction to the Keil µVision IDE :

The Keil µVision IDE is an integrated embedded software development environment for project management, program editing, debugging, and simulation.



III. RESULT :

The device is moving in the direction of sound source.This is done by taking the sound input from a microphone.This sound input signal is amplified using a pre-amplifier circuit and this amplified signal is given to a monostable multivibrator.The output of monostable multivibrator is given to a micro-controller.Four similar circuits are connected and all the input signals are given to the controller,through multivibrator after amplification,whose output drives the DC Motors.DC motors are interfaced to the controller using a motor driver ic.

IV. CONCLUSION

Hence this project titled “A Smart Sound Tracking Device” has completed successfully which is a small module of robotics.This can be extended further for future scope by interfacing a camera to it,which can take a photograph of the area and send it to a preset number by MMS.This can be used for security purpose as well.Depending upon the region of interest it can be interfaced with any module required.In this way there are a wide range of applications.

V. FUTURE SCOPE

It can be used for high security purpose in military by tracking the sound and pointing out the target in the war fields.It can be used in hospitals also for efficient patient monitoring by extending it with a buzzer or alarm sound.It is a module of robotics.It can also be used for defence purpose.

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