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Wheelchair for Physically Disabled People with Voice and Ultrasonic Sensor

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Abstract:

In this project the electric wheelchair is used for the movement of disabled and aged people. Here ultrasonic sensors and voice IC will be used. Ultrasonic sensors are used to detect the obstacles. The obstacle avoidance system aimed for providing more autonomous navigation of a electric wheel chair. These technologies seek to increase the independence of people with disabilities and improve the quality of people. Electric wheelchair has been equipped with control unit based on Microcontroller. Sensors are placed in front, left, right, to the wheelchair and it is used to detect the obstacles in those directions. The motors and ultrasonic sensor are connected to the microcontroller LPC2148. Here one more voice IC is connected to the ARM7 processor. Whenever any obstacle is came in front of the ultrasonic sensor it will detect and immediately gives voice signal through voice module.

Index-terms:

LPC2148 processor, ultrasonic sensor, APR9600 voice IC, DC motors, L293 driver, wheel chair.

I.INTRODUCTION:

In today's time, an estimated 1% of the world's population needs a wheelchair. An increased percentage of elderly and disabled people who want to enhance their personal mobility, for them wheelchair is the best assistive device. A disabled or an invalid individual (usually the disability of the lower part of the body) can find it convenient to move around and maneuver using the help of a chair constructed on wheels which can either be pushed by another individual or propelled either by physical force or electronically. Such a chair is called as a Wheelchair. The number of Physically Challenged people, who wants to move around with the help of some artificial means, whether through illness or an accident, is continuously increasing.

Driving a wheelchair in domestic environments is a difficult task for a normal person and becomes even more difficult for people with arms or hands impairments. Science and technology offer several ways to reduce the disadvantage caused by disabilities. The focus area is located at of the environment and of the individual. Remaining at the individual, if the goal is to reduce disability rather than the disability, the projects seek to restore some of functional capacity lost by relying on aid technical. This article discusses a method of navigation for obstacle avoidance using techniques developed in robotics. The peculiarity of this electric wheelchair for disabled own powers of perception, action and information processing. This gives the possibility of diagnosis, decision making and above all interaction with the environment by avoiding the obstacles facing the courtyard of navigation.

II. RELATED WORK:

2.1.BLOCK DIAGRAM:

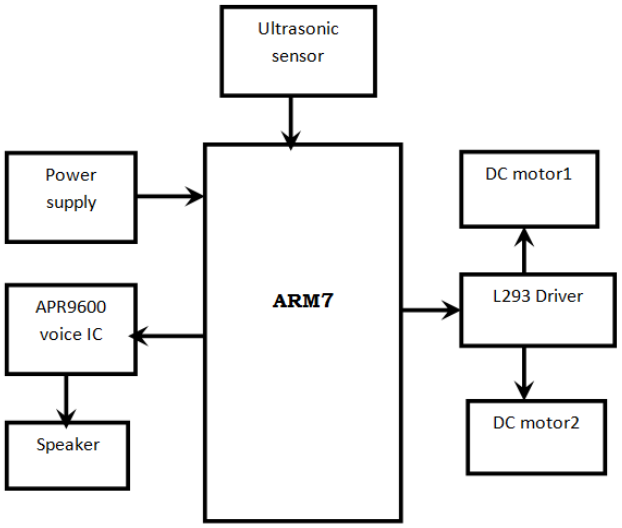

Figure-1: Block Diagram

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2.2.ARM processor:

The ARM7TDMI-S is a general purpose 32-bit micro-processor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the in¬struction set and related decode mechanism are much simpler than those of micro programmed Complex Instruc¬tion Set Computers (CISC). This simplicity results in a high instruction throughput and impressive real-time inter¬rupt response from a small and cost-effective processor core.

Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue. The key idea behind Thumb is that of a super-reduced instruction set.

2.3 DC motor:

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

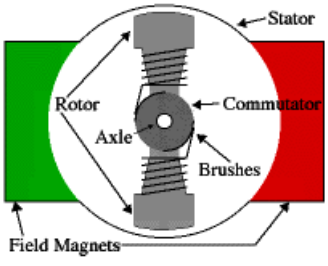

Figure-2: DC motor.

2.4 Ultrasonic sensor:

With ultrasonic sensor small as well as large object can be detected aptly but it becomes difficult to distinguish the size of object as the result of emission is found in the shape of cone. If you want to know the accurate distance of object without any other kind of detection like size, color, etc then you can opt for ultrasonic sensors.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, Using IO trigger for at least 10us high level signal, the Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. If the signal back, through high level, time of high output IO duration is the time from sending ultrasonic to returning.

Figure-3: Ultrasonic sensor

2.5 APR9600 VOICE IC:

The APR9600 device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds. The device supports both random and sequential access of multiple messages. Sample rates are user-selectable, allowing designers to customize their design for unique quality and storage time needs. Integrated output amplifier, microphone amplifier, and AGC circuits greatly simplify system design. The device is ideal for use in portable voice recorders, toys, and many other consumer and industrial applications. APLUS integrated achieves these high levels of storage capability by using its proprietary analog/multilevel storage technology implemented in an advanced Flash non-volatile memory process, where each memory cell can store 256 voltage levels. This technology enables the APR9600 device to reproduce voice signals in their natural form. It eliminates the need for encoding and compression, which often introduce distortion.

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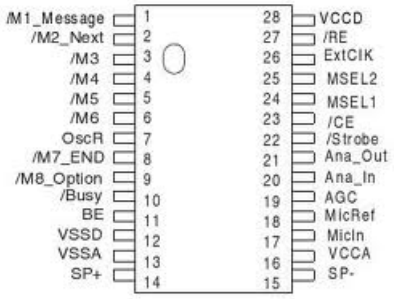

III. RESULTS:

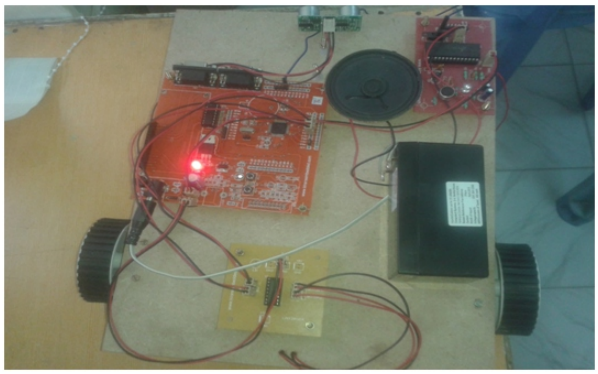

Figure-5: Hardware implementation (1)

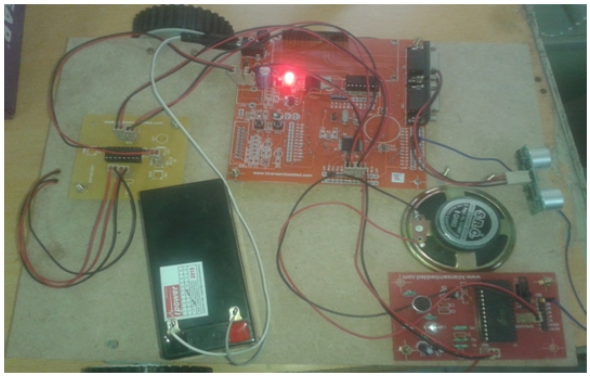

Figure-6: Hardware implementation (2)

IV. CONCLUSION:

Recent advancements in the technology are making lives easier for everybody. The system was successfully implemented to move the wheelchair left, right, forward, backward or stay in same position. Thus the wheelchair understands the signals coming from sensor and reacts accordingly. In the future work, is to provide a friendly atmosphere for disabled persons that is alerting in case of obstacles and updating the whole indoor environment condition to wheel chair and giving controlling of the devices at wheel chair itself which avoids the problem of approaching the switch.

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