Movement Based Voice Enabled Robotic Chair for Physically Challenged

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Abstract

There are lots of handicaps and elders in the world. Many of them are not able to move as easily as normal people. It is useful if we develop an automatic wheelchair to help them move more freely. In this paper we proposed a design of small-area automatic wheelchair to help handicaps or elders are able to move easily in a small area. The most concern in this project is low cost with acceptable performance rather than high velocity or high accuracy. The main aim of this project is to control the devices and to ask the basic needs like water, food or medicine by using MEMS (Micro Electro-Mechanical Systems) technology. MEMS is a Sensor which is a highly sensitive sensor and capable of detecting the tilt. This sensor finds the tilt is to the right side then the device will be on for the first time then next time it will be off. In the same way, if the tilt is to the left side then another device is going to be controlled. The tilt is in upwards or downward direction the related need will be announced. This device is very helpful for paralysis and physically challenged persons.

Keywords:*MEMS(Micro-ElectroMechanical)Systems, APR9600(Single-Chip Voice Recording & Playback Device), Motor DriverL293D,robotic wheel chair.*

1. Introduction

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers. Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result. As everyone in this competitive world prefers to make the things easy and simple to handle, this project sets an example to some extent. In this project we use accelerometer to recognise which type of move is this. Depend upon accelerometers output ADC converts to digital format is moved in the respective direction i.e. either in forward, backward, left or right direction.

2. Technology to Improve Mobility

In order to increase the mobility of wheel chair technology used is MEM stands for Micro-Electro Mechanical Systems. MEMS techniques allow both electronic circuits and mechanical devices to be manufactured on a silicon chip, similar to the process used for integrated circuits. This allows the construction of items such as sensor chips with built-in electronics that are a fraction of the size that was previously possible.

Microelectromechanical systems (MEMS) are small integrated devices or systems that combine electrical and mechanical components. They range in size from the sub micrometer (or sub micron) level to the millimetre level and there can be any number, from a few to millions, in a particular system. MEMS extend the fabrication techniques developed for the integrated circuit industry to add mechanical elements such as beams, gears , diaphragms, and springs to devices. Examples of MEMS device applications include inkjet-printer cartridges, accelerometers miniature robots, micro engines, locks, inertial sensors, micro transmissions, micro mirrors, micro actuators optical scanners, fluid pumps, transducers, and chemical, pressure and flow sensors. New applications are emerging as the existing technology is applied to the miniaturization and integration of conventional devices.

These systems can sense, control, and activate mechanical processes on the micro scale, and function individually or in arrays to generate effects on the macro scale. The micro fabrication technology enables fabrication of large arrays of devices, which individually perform simple tasks, but in combination can accomplish complicated functions. MEMS are not about any one application or device, nor are they defined by a single fabrication process or limited to a few materials. They are a fabrication approach that conveys the advantages of miniaturization, multiple components, and microelectronics to the design and construction of integrated electromechanical systems. MEMS are not only about miniaturization of mechanical systems; they are also a new paradigm for designing mechanical devices and systems.

3. Block Diagram

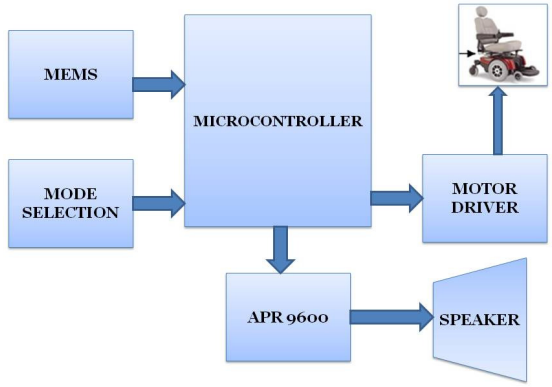

Fig. 3.1 Block Diagram of system

Fig.1 shows the schematic diagram of movement based voice enabled robotic chair for physically challenged. It has following important blocks

MEMS
MICROCONTROLLER
APR 9600
Motor Driver L293D

The Intel 8052 is Harvard architecture, single chip microcontroller (µC) which was developed by Intel in 1980 for use in embedded systems. It was popular in the 1980s and early 1990s, but today it has largely been superseded by a vast range of enhanced devices with 8052-compatible processor cores that are manufactured by more than 20 independent manufacturers including Atmel, Infineon Technologies and Maxim Integrated Products. 8052 is an 8-bit processor, meaning that the CPU can work on only 8 bits of data at a time. Data larger than 8 bits has to be broken into 8-bit pieces to be processed by the CPU. 8052 is available in different memory types such as UV-EPROM, Flash and NV-RAM.

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes.

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. Output from APR is fed to speaker for movement announcement. If the movement is wrong or movement button is press by unintentionally then this movement can be stop by reset button otherwise depend upon command movement continues.

Motor Driver L293D this 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. To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included. This device is suitable for use in switching applications at frequencies up to 5 kHz. The L293D is assembled in a 16 lead plastic package which has 4 center pins connected together and used for heat sinking The L293DD is assembled in a 20 lead surface mount which has 8 center pins connected together and used for heat sinking.

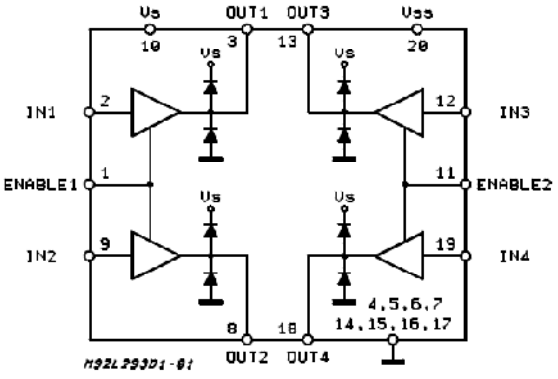

Fig.3.2 Block Diagram of L293D

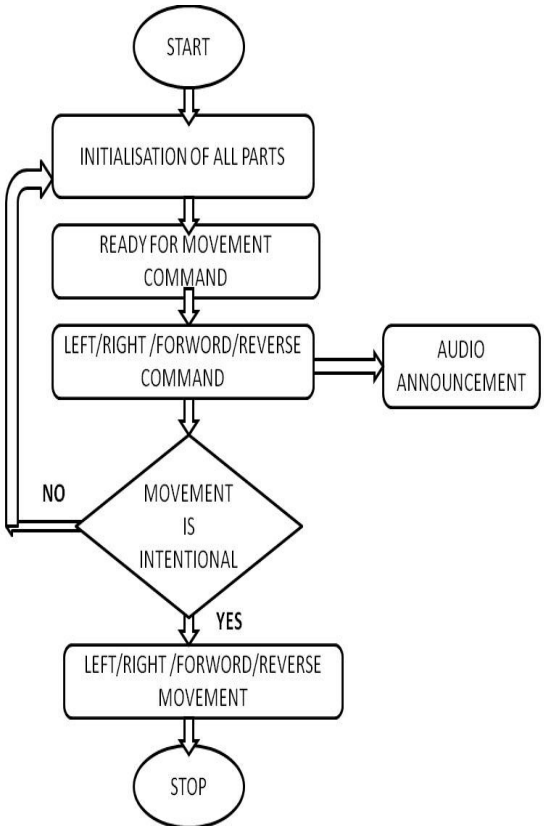

Fig 3.3 Flow Chart of System

4. Results

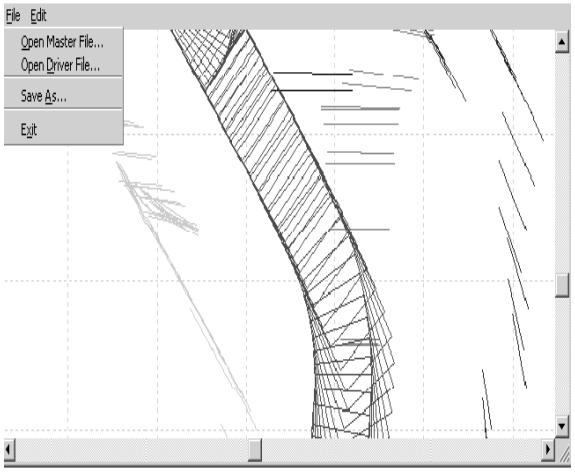

Fig.4.1 Wheel Chair Movements

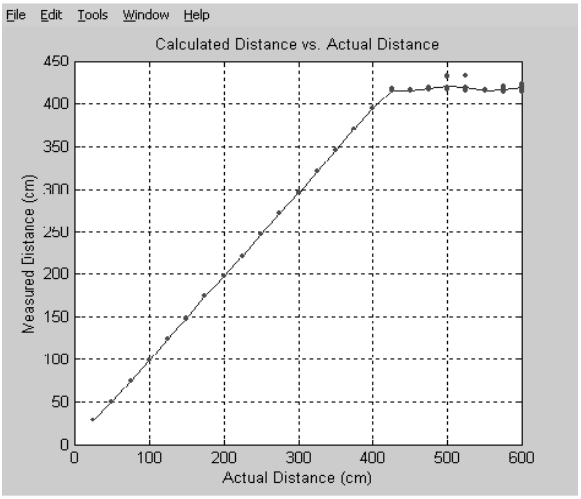

Fig.4.2 Actual v/s Measured Distance

5. Conclusion

System develops an automatic wheelchair it will be helpful them move more freely. With help of Microcontroller system is efficient & Cost effective but we also took care to ensure that the "robotic" parts of the wheelchair did not make the system look much different than a standard powered wheelchair.

Much remains to be done to create the complete system that will perform vision-based navigation in the way we are envisioning. We must investigate how the wheelchair's user will be able to contribute to the task at hand.

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