

INDEPENDENSE MOBILITY: WHEELCHAIR

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Abstract : This paper present a wheelchair tilt communicator system that system could be used by physically disable persons who cannot move their hands or legs but make head and eye motions **and speech**. This wheelchair could be operated in any direction using head tilt movements by the disabled person. Design and development of Head motion controlled wheelchair has been achieved using MEM sensors and microcontroller. The MEM Sensor senses the change in direction of head and accordingly the signal is given to microcontroller. Depending on the direction of the Acceleration, microcontroller controls the wheel chair directions with the help of DC motors. This wheelchair is aimed to be designed at a lower cost as compared to the other wheelchair available in the market.

IndexTerms-Arduino, microcontroller, DC motor, wheelchair, voice recognition, MEMS sensor.

I. INTRODUCTION

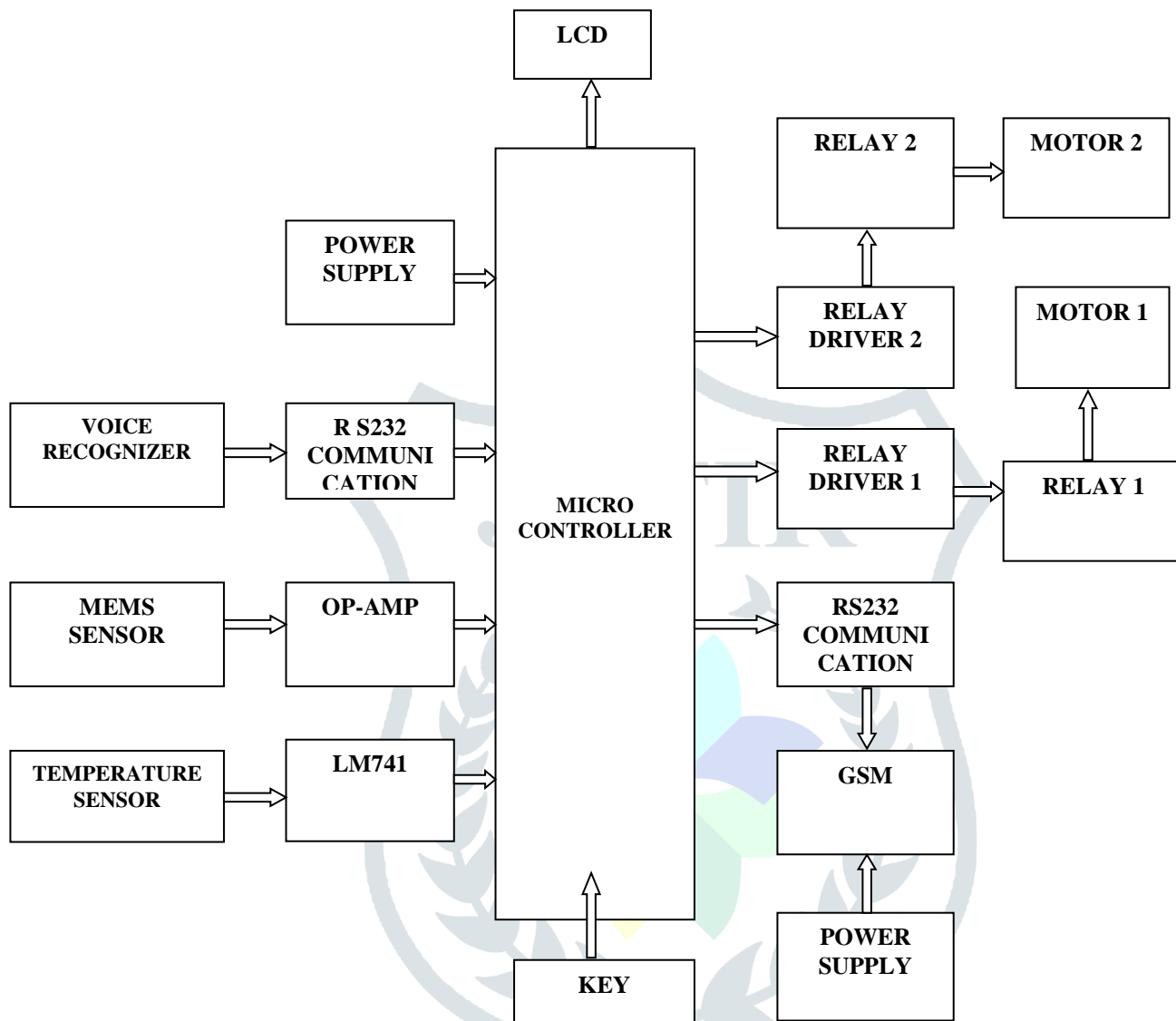
Centuries ago, people with disabilities who survived for an extended period of time were transported on hammocks slung between poles which were carried by others. This was the preferred means of transportation of the upper class and thus carried no stigma. Later the wheelbarrow was developed and soon became a common mode of transportation for people with disabilities. Because wheelbarrows were used to transport materials, during this period in history, people with disabilities were looked upon as outcasts from society. During the renaissance, the French court popularized the first wheelchairs. Wheelchairs were overstuffed arm chairs with wheels placed upon them. This enabled movement, with assistance, indoors. Later the wooden wheelchair with wicker matting was developed. This type of chair remained the standard until the 1930s. Franklin D. Roosevelt was not satisfied with the wooden wheelchair and had many common metal kitchen chairs modified with wheels. In the 1930s a young mining engineer, named Everest experienced an accident that left him mobility impaired. Within a few years, they formed a company Everest & Jennings to manufacture wheelchairs. Following World War II, medical advances saved the lives of many veterans with spinal cord injuries or lower limb amputations, who would have otherwise died. Veterans medical centres' issued these veterans steel framed wheelchairs with 18 inch seat widths. These wheelchairs were designed to provide the veteran some mobility within the hospital and home, and not to optimize ergonomic variables. Just as among the ambulatory population, movability among people with ailment varies. Mobility is more of a functional limitation than ailment related condition. Power wheelchairs provide greater independence to thousands of people with severe mobility destruction. Mobility has become much needed for an excellence of life. Loss of flexibility due to an injury is usually accompanied by a loss of self-confidence and self-assurance [1]. Tetraplegia are limited in their motion and need some device to communicate with their wheel chair for mobility without others assistance [2]. Designing a system with independent susceptibility of motion for such disabled people is our aim in this project.

Paper Organization : In this paper, Independence wheel chair has been presented in 2nd sections where basic working of electronic circuit used in the Independence wheelchair. In section 3rd present the block diagram with description of components used in this type of wheelchair. Finally, the results obtained and conclusions from the designed system is presented in section 4th and 5th respectively.

II. BASIC WORKING OF ELECTRONIC CIRCUIT

This system is an involuntary head tip movement controlled wheelchair that could operate in any way using head movements, i.e. Left, Right, Forward and Rearward. It stops when the person does not tip his head in any way. In this paper, the project describes a wheelchair for physically disabled people developed using head motion and MEM sensor which is interfaced with DC motors [3]. MEM SENSOR is a Micro Electro Mechanical Sensor can be used to convert head movement into computer interpreted signals. The accelerometer data is filtered and also calibrated for motion recognition The accelerometers can measure the magnitude and direction of gravity in addition to movement induced acceleration [4].

III. BLOCK DIAGRAM

**Description of components used in independence mobility wheelchair:**

Various components used in this project are described below:

MEMS sensor: MEMS sensor is a Micro Electro Mechanical Sensor can be used to convert head movement into computer interpreted signals.

Relays: A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch also used as solid-state relays. Relays are used for to control a circuit through a low-power signal. In this project, we have used 4 SPDT relays in order to operate the two DC motors of the wheelchair.

DC Motor: DC geared motors are used in our wheelchair to drive the system in forward, backward, left and right directions. 12 V DC motors have been used powered by a rechargeable battery of 12 V.

RS232 communication port: RS232 is a standard protocol used for serial communication, it is used for connecting computer and its peripheral devices to allow serial data exchange between them.

LM 741: Its main purpose is to amplify (increase) a weak signal .

Microcontroller: Microcontroller is built with 40 pins dual inline package, 4kb of ROM storage and 128 bytes of RAM storage, 2 16-bit timers. It consists of are four parallel 8-bit ports, which are programmable as well as addressable as per the requirement. In this paper, a microcontroller system that enables standard electric wheelchair control by head motion is developed.

Arduino microcontroller : The Atmega328 may be a highly regarded microcontroller chip made by Atmel. It is associate 8-bit microcontroller that has 32K of non-volatile storage, 1K of EEPROM, and 2K of internal SRAM. The Atmega328 has 28 pins. The Atmega328 has 28 pins. It has fourteen digital I/O pins, of that vi may be used as PWM outputs and vi Analog input pins. These I/O pins account for twenty of the pins. The Atmega328 is one amongst the microcontroller chips that are used with the popular Arduino Duemilanove boards. The Arduino Duemilanove board comes with either one of two microcontroller chips, the Atmega168 or the Atmega328. Of these 2, the Atmega328 is that the upgraded, more advanced chip. Unlike the Atmega168 that has 16K of flash program memory and 512 bytes of internal SRAM, the Atmega32 has 32K of flash program memory and 2K of

Internal SRAM..

Power Supply: A device or system that provides electrical or alternative forms of energy to associate output load or cluster of masses is termed an influence offer unit or PSU. The power supply consists of 230V as mains supply, step down transformer, diodes, capacitor filter, voltage regulator(IC 7805) and resistors.

GSM module: The GSM module will be used here as the base principle for location.

Scope and Future Prospects of the Project:

- Solar panel roof can be used as alternative power source and also it can be a protective layer from rain and sun.
- This wheelchair save more time and More effective compared to other wheelchair.

IV. RESULTS AND DISCUSSION

After the completion of our project, Independence mobility wheelchair for disabled person, we have tested it for various cases and the wheelchair is working successfully for all the situation. MEMS sensors is also working good. We could easily operate the wheelchair in forward, rearward, left or right ways using head motions and stop the wheelchair as and when desired by the user.



fig.1 independence wheelchair

V. CONCLUSION

With the completion of our wheelchair, we have concluded that it works well for head motions and it proves to be an effective solution for quadriplegic patients with more than 45 % disability or for the patients with spinal cord injury who could not move their hands and legs for driving a manual or automatic wheelchair also wheelchair controlled by speech. This system shows better than automatically joystick powered wheelchairs in terms of get better of operation and head tilt control. Also, the project comes out to be economically as compared to other available wheelchairs in the market.

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