IOSR Journal of Electronics and Communication Engineering (IOSR-JECE)
e-ISSN: 2278-2834,p- ISSN: 2278-8735.
PP 17-19
www.iosrjournals.org

Gesture Controlled Intelligent Wheel Chair

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ABSTRACT: *Electric wheelchairs are designed to aid paraplegics. Unfortunately, these cannot be used by persons with higher degree of impairment, such as quadriplegics, i.e. persons that, due to age or illness, cannot move any of the body parts, except of the head. Medical devices designed to help them are very complicated, rare and expensive. In this paper a microcontroller system that enables standard electric wheelchair control by head motion is presented. The system comprises electronic and mechanic components. A novel head motion recognition technique based on accelerometer data processing is designed. The wheelchair joystick is controlled by the system's mechanical actuator. The system can be used with several different types of standard electric wheelchairs. It is tested and verified through an experiment performed within this paper.*

I. Introduction

Quadriplegics are persons who are not able to use any of the extremities. The reasons for such decreased motion possibilities can be different: stroke, arthritis, high blood pressure, degenerative diseases of bones and joints and cases of paralysis and birth defects. Also, quadriplegia appears as a consequence accidents or age. The patients with such severe disabilities are not able to perform their everyday actions, such as: feeding, toilette usage and movement through space. Depending on the severity of the disability, a patient can retain freedom of movement to a certain level by using different medical devices

There are two types of medical devices that enable independent movement to a person suffering from paraplegia. Those are expose lets and wheelchairs. Both of these contain electronic systems to enable and improve person's movement ability both in outdoor and indoor conditions. Electronic systems, such as sensors, actuators, communication modules and signal processing units, are used to recognize the activity that the patient is trying to perform and help him carry it out in coordination with the commands given. The application of the two mentioned devices is different. Exoscelets must provide body support, simpler one. Thus, the wheelchairs are used more often [1]. Nevertheless, only patients with healthy upper extremities (paraplegics) can successfully operate standard electric wheelchairs. The patients who cannot use any of their extremities (quadriplegics) cannot operate these

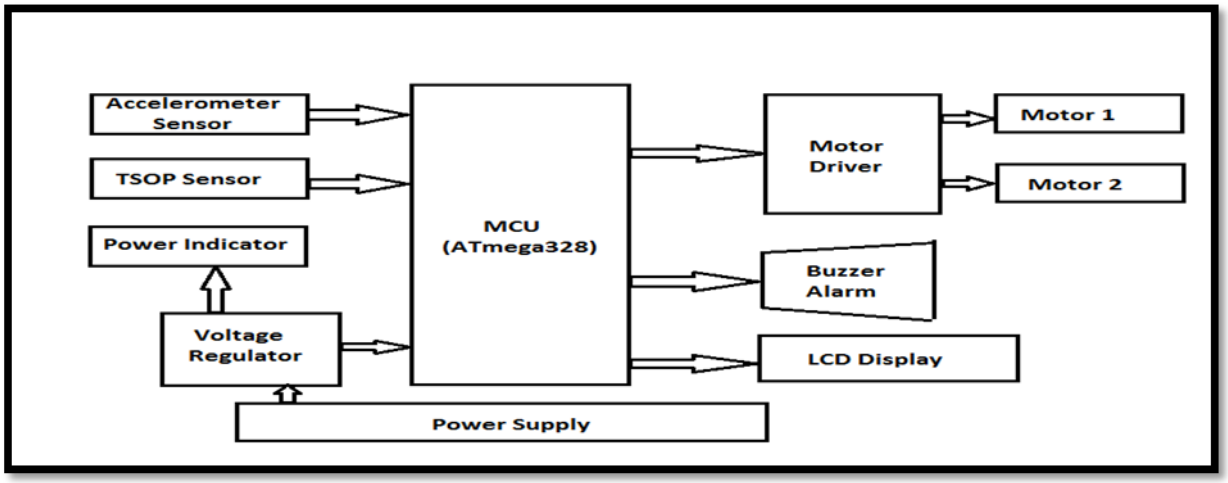
In such cases, when the patient is not able to use the standard control interface, other approaches are used. Through numerous research projects in this area, several different solutions have been developed, such as: SENARIO VAHM, Rolland , SIAMO , Wheels, and Omni wheels platform . Electronic systems in common for all these projects are sensors, signal processing units, software that translates user's commands into medical device actions. These solutions are dubbed robotic wheelchair. User can control the device via touch screens and voice commands. Besides these, wheelchair control is also possible by eye movement and electromiographicsensors. Such interfaces are Telethesisand Eagle Eyes.

Detailed overview of these researches can be found in for human-machine interaction human motion recognition is also used In this paper, a microcontroller system that enables standard electric wheelchair control by head motion is developed. A prototype of the system is implemented and experimentally tested. The prototype consists of the digital system (an accelerometer and a microcontroller) and a mechanical actuator.

The accelerometer is used to gather head motion data. To process the sensor data, a novel algorithm is implemented using a microcontroller. The output of the digital system is connected with the mechanical actuator, which is used to position the wheelchair joystick in accordance with the user's command.

Sensor data is processed by a novel algorithm, implemented within the microcontroller. Thus, user head motion is translated into electric wheelchair joystick position. Mechanical actuator is compatible with several different types of standard electric wheelchair. Through the performed experiment, the system's ability to correctly recognize user's command is verified. Results of the experiment are given and discussed in this paper. Block diagram of the system is shown in Fig

II. Block Diagram



III. Description

Our project handicap wheelchair basically works on the principle of acceleration, one acceleration sensor, provides two axes, acceleration sensors whose output is analog, varies according to acceleration applied to it, by applying simple formula we calculate the amount of tilt & output of tilt will decide to move in which direction. Sensor gives x-axis & y-axis o/p independently which is fed to ADC & then µC & depending on the pulse width it decides to move or not. On chair Obstacle sensors will be installed. Total 4 sensors will be installed for detection of wall/obstacle in the forward, backward, left & right direction.

IV. Advantages

1. Increased mobility, For disabled people who cannot use their arms to power a manual wheelchair, or for people who do not have the upper body strength to self-propel manual wheelchair, power wheelchairs offer the ability tube mobile with the use of a joystick or mouthpiece, such as the sip and puff control described by Wheelchair.ca ora tongue-controlled wheelchair.
2. Increased Manoeuvrability, Power wheelchairs use casters that swivel a full 180 degrees to provide more manoeuvrability, especially in small areas, according to the Electric Wheelchairs enter. Manoeuvrability is one of the key problems associated with wheelchair use. Power wheelchairs allow a disabled individual to get around tight spaces and move through smaller areas, which is especially beneficial at home.
3. Increased Physical Support, A power wheelchair can have the option to allow for more physical support, including adjustable seating such as tilt and recline.
4. Power wheelchair users can also adjust the height of the chair to see their environment more clearly. Some power wheelchairs also have the option of elevation to help a person get to a standing position.
5. Increase disabled peoples ability to live independently to enjoy the same choice, control and freedom as any other citizen
6. at home, at work, and as members of the community.
7. Enable young disabled children and their families to enjoy „ordinary" lives, through access to childcare, early education and early family support to enable them to care for their child effectively and remain socially and economically included;
8. Support disabled young people and their families through the transition to adulthood. Transition will be better planned around the needs of the individuals and service delivery will be smooth across the transition; and
9. Increase the number of disabled people in employment while providing support and security for those unable to work.
10. Improving the life chances of disabled people.

V. Applications

1. Hospitals
2. Health care centres
3. Old age home
4. Physically handicapped individuals
5. In industries as robot to carry goods.
6. Automatic gaming toys.
7. Communication
8. Control of Mechanical systems
9. Sports

VI. Conclusion

1. Automated wheelchair can be used to help handicapped people, especially those who are not able to move.
2. Our project was the complete addition of the electronic circuits, the hardware designing & software knowledge.
3. Various related work in the field of Automated Wheelchair.
4. Limitation of Existing System.
5. The system was successfully implement have the wheelchair left, Right, Forward, Backward

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