WHEEL CHAIR CONTROLLED BY HEADMOTION

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***Abstract*: In this project we are design a smart wheel chair for physically challenged person using head motion. The main objective of project is creating a user friendly wheel chair for physically person based on head motion and based distance for detecting an obstacle or object. This project consists of ultrasonic sensor and accelerometer. Ultrasonic sensor is used to find a distance between wheel chair and its opposite obstacle. Movement of wheelchair is programmed based on head movement of physically challenged person. During that movement period ultrasonic sensor calculate distance and the wheel chair is going closer any other object wheel chair is alarm is activated and wheel chair is stopped. It is effective way of controlling a wheel chair the turning left and right movement is easily controlled by head motion based on user it will automatically stop wheel chair its closer any obstacle. In this method of controlling a wheel chair easy handled by physically challenged person.**

***Keywords*: MEMS sensor, DC Motor Driver,Arduino Micro Controller,Ultrasonic Sensor, Vibration Sensor, Heartbeat Sensor**

INTRODUCTION

The advancement and development of technology has always influenced a few parts of our lives since quite a while and will keep on doing as such later on with additional capacity and more unexpected development. In our project we have attempted our best to correlate between the advancement of technology and the human requirement, for human ease. The main aim of this project is to control wheel chair through human direction. This project is mainly designed for physically challenged people who are dependent on wheelchairs and especially those people who can't utilize their hand to drag their wheel chair on account of some incapacity. In this system we have used head motion module to recognize the motion of the user for controlling the direction of the wheelchair. The prototype of the wheel chair is built using arduino, chosen for its low cost, in addition to its versatility and performance in mathematical operations and communication with other electronic devices[1-10]. The system has been structured and actualized in a savvy way so that if our venture is marketed the poor clients in developing nations will profit by it. We trust our project for some valuable activity and give some headway in innovation, and most vital this may give some assistance to the debilitation individual.

Motion recognition is a process in which a receiver recognizes user's motion. In this context, motions are expressional movements of human body parts, such as: fingers, hands, arms, head, face, legs. The purpose of these movements can be information transfer or the interaction with the environments. Motion recognition is applicable in various fields: enabling children to interact with a computer, understanding sign language, medical devices development, navigation and manipulation of the virtual environment, tracking psychophysical condition of the driver in order to reduce the number of accidents, lie detection, etc. [15]. There are many different motion recognition approaches, of which the most common are based on hidden Markov models [16] and based on artificial intelligence (fuzzy logic and neural networks) [17]. Besides in theoretical approach, motion recognition techniques also differ in devices used for implementation. Namely, in order to recognize significant motions, the information on these motions must be known at all times. In order to acquire these informations different recording systems are used. Standard input devices, such as keyboard or mouse are not suitable for this kind of human-machine interaction. Thus, the devices that record position and attitude of human body parts, skin susceptibility, face expressions and so on, are used [15].

Motion recognition is a very intuitive way to interact with electronic devices, but there are technical difficulties. First of all, there is no standardized library in the field of motion recognition. Thus, in most cases the user has to define a personal motion library, the library of personalized motions. When using personalized motions, it is very hard to gather a large set of sample moves, needed for statistic methods application, such as hidden Markov models. A difficulty is also a fact that the recognition has to be done online (immediately) in order for such interaction to make sense. This fact affects the resources of the receiver – its characteristics have to be considered, such as processing power and, consequently, battery capacity. The most common motion recognition approach is based on computer vision techniques. These techniques are limited by their hardware (the cameras are necessary) and high processing power requirements (video processing). Inertial sensors, characterized by low power and low prices, have become available in recent years. Besides these two positive properties, they are also characterized by very small dimensions. These characteristics qualifie them to be used in motion recognition field. There are several different approaches to motion recognition by inertial sensors [18 – 20]. Besides stand alone sensors, other devices can also be used, such as cell phones [18] and game controllers [20].

Unfortunately, day by day the number of handicapped people is going on increasing due to road accidents as well as the disease which leading paralysis. Among people with disabilities, percentage of physically handicapped person is most. If a person isdebilitated, he is reliant on other individual for his everyday work like transport, food and so on. So a head motion operated wheel chair is developed which will operate automatically on the motion of head from the handicapped user for movement purpose. Use of electrical wheelchair prompts a lot of freedom for people with a physical handicap who can neither walk nor operate a mechanical wheelchair alone[11-17].

In this modern world the technology is increasing day by day. With using this technology we create a solution for anything. In our project using embedded technology we are creating a smart wheel chair for physically challenged person. Using our project physically challenged person can move without third person help. Our project is created based on head movement of user can move forward and reverse and turning wise it designed using head movement. The obstacle is avoided by using ultrasonic sensor and emergency alarm activated the obstacle the wheel chair automatically stopped. It is effective way of controlling a wheel chair also it easily handled by physically challenged person.

Background Work

There are two types of medical devices that enable independent movement to a person suffering from paraplegia. Those are exoscelets 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, which makes them more complex. Also, an error in patient's command recognizing process can lead to very serious consequences – fall and, eventually, injury.

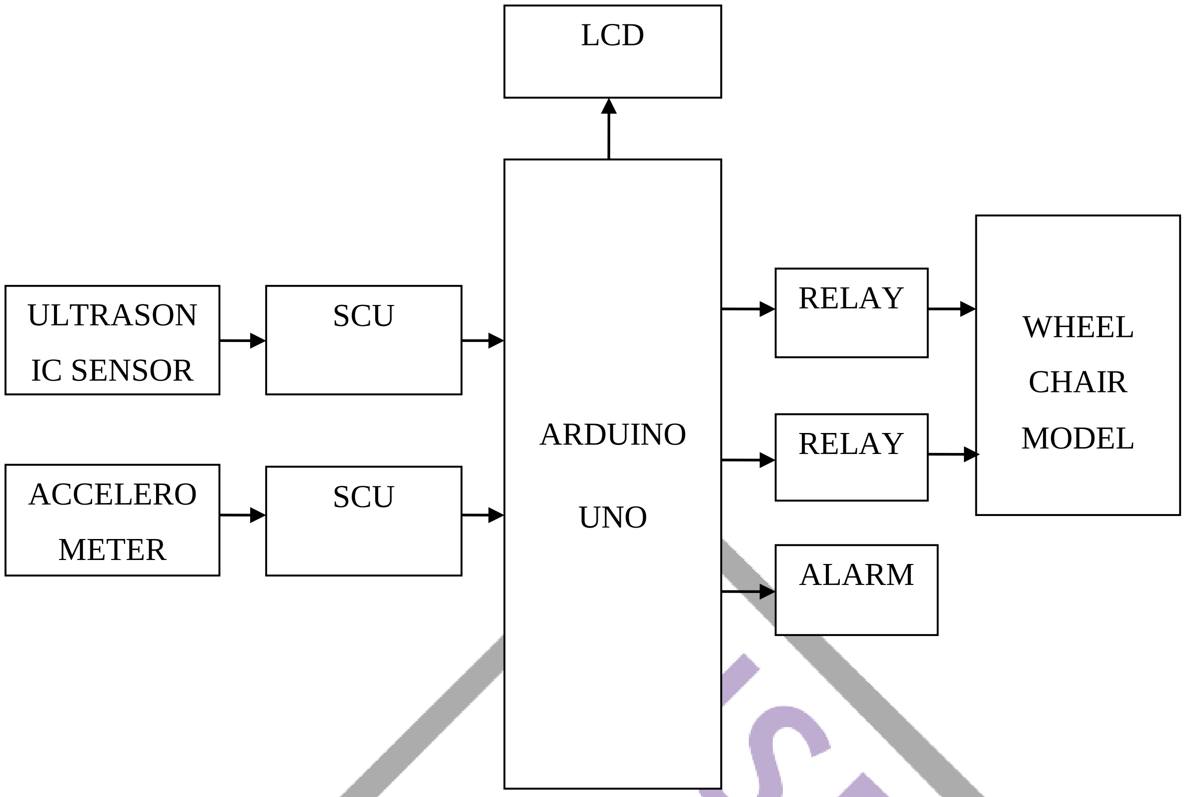
Wheelchair operation is based on navigation, which, in this case, is defined as safe transport from the starting point to a given destination. The wheelchair, comparing to the exoscelet, are a more general medical device and a much simpler one. Thus, the wheelchairs are used more often [1]. Nevertheless, 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 [2].

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 [3], VAHM [4], Rolland [5], SIAMO [6], Wheelesley [7], and omniwheeled platform [8]. 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 touchscreens [9 – 10] and voice commands [11]. Besides these, wheelchair control is also possible by eye movement and electromiographic sensors. Such interfaces are Telethesis [12] and EagleEyes [13]. Detailed overview of these researches can be found in [1]. For human-machine interaction human motion recognition is also used [14 – 20].

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. The 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.

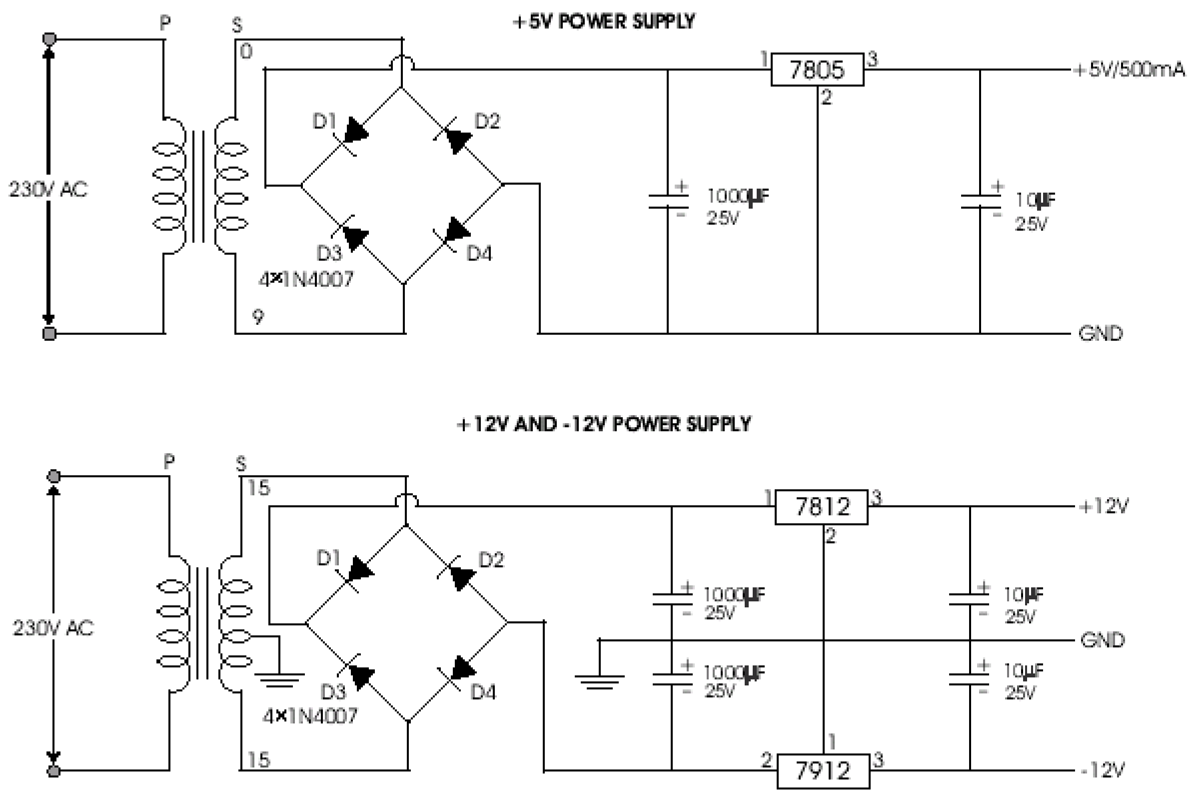
METHODS

The working of our proposed system is creating a user friendly wheel chair for physically person based on head motion and based distance for detecting an obstacle or object. This project consists of ultrasonic sensor and accelerometer. Ultrasonic sensor is used to find a distance between wheel chair and its opposite obstacle. Movement of wheelchair is programmed based on head movement of physically challenged person. During that movement period ultrasonic sensor calculate distance and the wheel chair is going closer any other object wheel chair is alarm is activated and wheel chair is stopped. It is effective way of controlling a wheel chair the turning left and right movement is easily controlled by head motion based on user it will automatically stop wheel chair its closer any obstacle. In this method of controlling a wheel chair easy handled by physically challenged person.



IC voltage regulators

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts.



Circuit diagram (Power supply)

A fixed three-terminal voltage regulator has an unregulated dc input voltage, Vi, applied to one input terminal, a regulated dc output voltage, Vo, from a second terminal, with the third terminal connected to ground.

The series 78 regulators provide fixed positive regulated voltages from 5 to 24 volts. Similarly, the series 79 regulators provide fixed negative regulated voltages from 5 to 24 volts.

- For ICs, microcontroller, LCD --------- 5 volts
- For alarm circuit, op-amp, relay circuits ---------- 12 volts

Light signalization. In order to make the system more user friendly, enable faster learning and understanding of the system, LED indication is implemented (turning of and on of the B7 diode, Fig. 9). The system informs the user on its current state through LED signalization. It is already mentioned that the user has to lean the head over a threshold in order to start a command. During this movement (marked (1) in Fig. 5), the B7 LED blinks the first time. This informs the user that the head is leaned enough over the threshold. This means that the user can start the next movement, the second part of the command. Second threshold pass, in the opposite direction (the movement marked (2) in Fig. 5), lights up the same LED second time. Now the user can start the third part of the command, the movement marked with (3) in Fig. 5. There is no light signalization during the third pass of the threshold, because then the command is finished (this implies that the threshold is passed the third time).

Turning around. In this algorithm implementation, there is an intermediate step between the state of still and wheelchair rotation to any of the directions. Issuing a command “left” or “right” while in the state of still, the system goes into left rotation mode or right rotation mode, but the rotation does not start. When the wheelchair is in the left rotation mode, the rotation to the left will start when the user passes the left threshold. It lasts as long as the user keeps the head in the position below the threshold, and it stops when the user returns the head in the starting position. Analogously, for the rotation to the right. In this way, the user has the greatest possible resolution when choosing the driving direction. Both turning modes are finished and wheelchair is again in the state of still, when the user issues the opposite command, e.g. the left rotation mode is finished when the command “right” is issued.

CONCLUSION

The prototype consists of an electronic and a mechanical part. It is designed to be characterized by low price and high level of modularity. Namely, it can be used with several different types of standard electric wheelchairs. In future work we plan to complete the inertial navigational system by including the gyroscope. We assume that the usage of the additional sensor would improve the ability of the system to recognize the user’s commands. Also, the experiments to test the applicability of this system in real conditions are needed: (1) integrate the control of the wheelchair motors and repeat the experiment performed in this paper and (2) when the system becomes precise

This work elaborates the design and construction of Smart Electronic Wheelchair with the help of MEMS Module. The circuit works properly to maneuver because the command given by the user. After coming up with the circuit that allows physically disabled to regulate their wheel victimisation associate MEMS device application in their sensible phones and it's conjointly been tested and valid. The detection of any obstacle is with success controlled by the microcontroller. As the person switches on the circuit and starts moving, any obstacle that is anticipated to lie among a spread of four metres are detected by the unhearable device. This planned system contributes to the self-dependency of otherwise abled and older folks

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