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Hand Gesture Controlled Wheelchair

Misbah Ansari *1, Kimberly Anthony *2, Shreya Bhalerao*3, Shravani Bhalerao*4, Shreya Borate5, Prof. Shakti Kaushal*6

[1]Student, Department of Artificial Intelligence and Data Science, Ajeenkya D.Y Patil School of Engineering, Pune
[2]Student, Department of Artificial Intelligence and Data Science, Ajeenkya D.Y Patil School of Engineering, Pune
[3]Student, Department of Artificial Intelligence and Data Science, Ajeenkya D.Y Patil School of Engineering, Pune
[4]Student, Department of Artificial Intelligence and Data Science, Ajeenkya D.Y Patil School of Engineering, Pune
[5]Student, Department of Artificial Intelligence and Data Science, Ajeenkya D.Y Patil School of Engineering, Pune
[6]Professor, Department of Artificial Intelligence and Data Science, Ajeenkya D.Y Patil School of Engineering, Pune

ABSTRACT:

It is commendable that the rapidly advancing technology can usher in new developments in the healthcare industry. Modern technologies like the Internet of Things can easily remove the barriers that prevent people with impairments from receiving essential services. In this work, hand gesture-controlled wheelchairs are reviewed and thoroughly analysed. A promising technology meant to increase the independence and movement of those with physical limitations. The significance of the subject and the increasing interest in creating user-friendly control systems for assistive technology are covered in the abstract's first paragraph. It then presents a summary of existing research and development efforts in hand gesture driven wheelchairs, including various sensing technologies, gesture recognition algorithms, and planned.

I.INTRODUCTION

This study presents a novel method for converting a hand gesture into an electrical signal, processing it into a digital signal with the right strength, and then transmitting it via a transmitter. For those who are unable to move, have a paralyzed body part, or have lost a limb in an accident, this study offers a useful alternative. Man and machine will see a paradigm shift as a result of this wheelchair. We can also refer to this machine's interface, or human-machine, as the place where it will process user commands. As technology has advanced, efforts have always been made to apply it for the benefit of humankind.

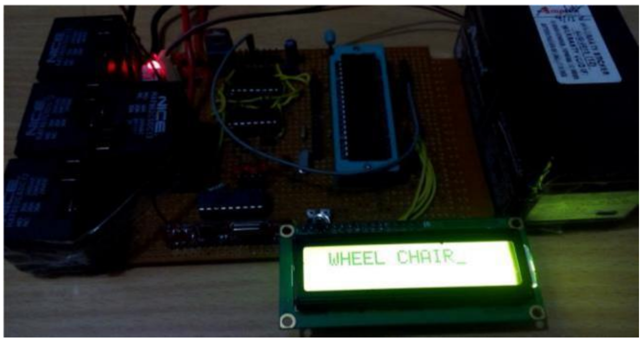


Fig 1: *Receiver circuit of wheel chair with control unit.*

II. NEED OF PROJECT

In India, the proportion of people with disabilities has grown in both rural and urban areas. The impairment may be inherited or the result of an illness or mishap. The purpose of this study is to develop a hand gesture-driven wheelchair that uses an accelerometer as a sensor to enable people with physical disabilities to move around just by waving their hands. Many people in India now suffer from disabilities; some have paralysis in their lower extremities. This wheelchair will improve comfort and slightly ease people's lives. 5436604 individuals are impacted by a mobility disability. The graph below displays the percentage of the population that is disabled.

Benefits to people who are:

a.) Person paralyzed.
b.) Crawling people.
c.) Those who walk with assistance.
d.) People experiencing acute or chronic issues with their muscles or joints.
e.) People with brittle bones, loose, involuntary movements, stiffness or tightness in their movements, or tremors in their bodies.
f.) Individuals with impaired neuronal and motor cell coordination.

g.) People whose paralysis or other conditions have caused them to lose feeling in the lower body.

h.) Individuals with twisted limbs or any other type of bodily abnormality

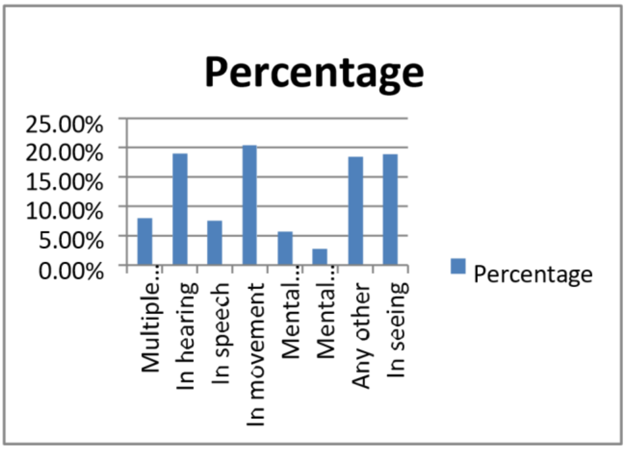


Fig 2: *Percentage of people suffering from different kind of disability*

III. TECHNOLOGY USED

The ADXL335 accelerometer is a sensor that moves in the X, Y, and Z axes, respectively, and gives analog signals in this motion control chair. When converting analog signals to digital signals, the LM324 operational amplifier is employed as a comparator. 434 MHz radio frequency transmitters are used to send signals wirelessly. To avoid interference from other devices, data is encrypted with a secure address using the IC HT12E encoder before being sent. The first task is to calibrate the accelerometer to our project's specifications so that we can properly regulate the wheel's power. To do this, we use a transformer and compare the output to see if there are any changes.

The first task is to calibrate the accelerometer to our project's specifications so that we can properly regulate the wheel's power. To do this, we use a transformer and compare the output to see if there are any changes. The 89S52 microcontroller is utilized for motor control and receiver module interface. Below is a picture of the main control board.

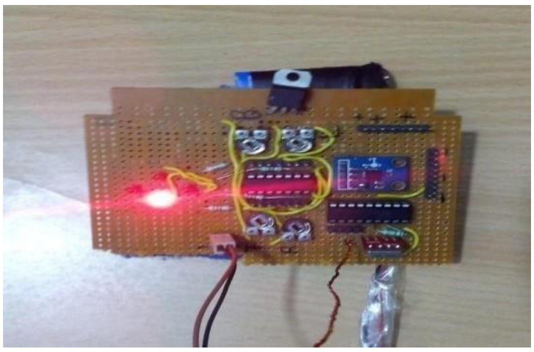


Fig 3: *Hand gesture circuit with accelerometer and transmitter*

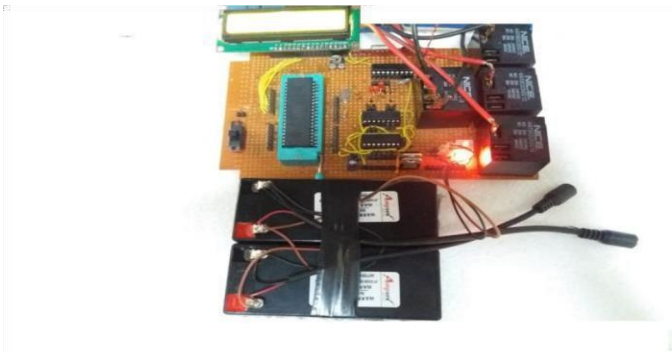
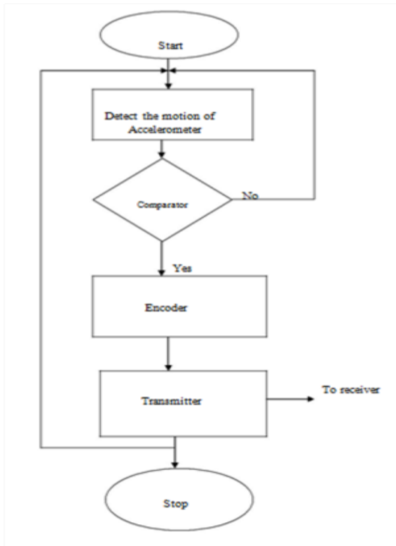


Fig 4: *Overall circuit of wheelchair that controls the motion of motor*

After that, the signal is transmitted wirelessly. The signal is now received by the receiver, which decodes it to identify the additional signal. Prior to being installed in the controller, the microcontroller compares the data after receiving the input signal. The signal is sent to the L293D IC, which then sends a signal to the relay, which causes the table's wheel to begin to move, if the input data is compared with the prior data set. Since the ADXL335 accelerometer can capture minute changes, we selected it as the measuring tool.

IV. FLOWCHART



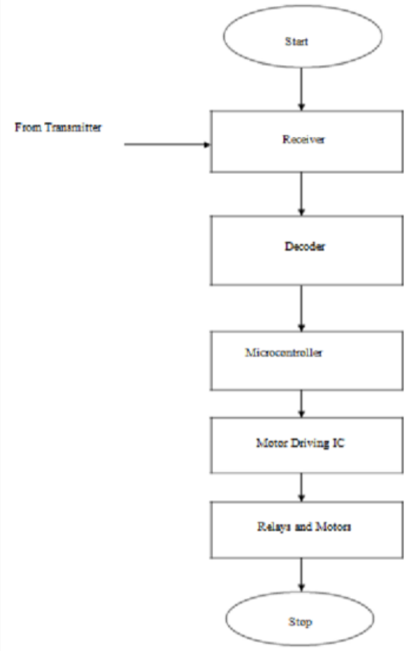
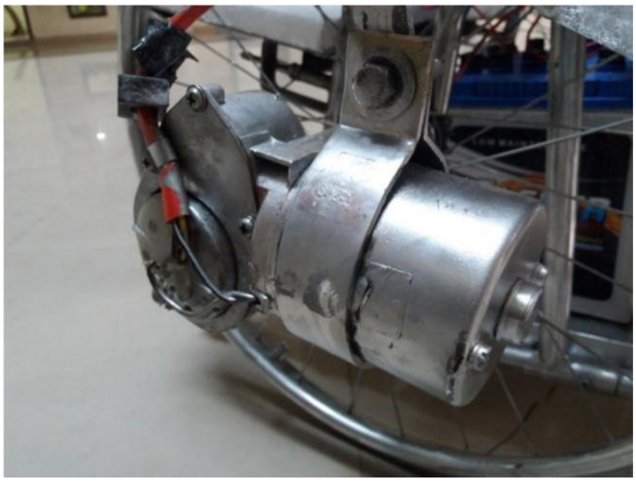


Fig 6: *Flowchart of processing of signals*

V. MOTOR USED

A permanent magnet, 17-watt, 24-volt DC motor powers the wheelchair. Every motor uses 0.73 amperes of current when there is no load and 9.61 amperes when there is a full load. The motor features an internal gear that allows the shaft to spin at 60 revolutions per minute in order to boost torque. These motors are used in vehicles such as trucks and cars, and they have the advantage of requiring relatively little maintenance compared to other motors. They can operate in any harsh environment, including mountains and deserts.



VI. WORKING DIRECTION OF WHEELCHAIR

Direction of hand gesture	Movement of left Motor	Movement of right Motor
Forward	Forward	Forward
Backward	Backward	Backward
Right	Forward	Stop
Left	Stop	Backward

Fig 8: *Direction motor with respect to direction of hand gesture*

VII. RESULT

Components	Input voltage supplied
Motors	24 volts
IC7805	11.91 volts
IC 7812	11.91 volts
ADXL	4.90 volt
LM324	4.90 volt
HT12E	4.90 volt
Transmitter module	4.90 volt
HT12D	4.96 volt
Receiver module	4.96 volt
89S52 micro controller	4.96 volt
L293d	11.91, 4.96 volt

Fig 9: *Components and input voltage supplied to them*

Movement of wheelchair	Threshold angle of hand gesture
Forward	25 Degree forward
Backward	35 Degree backward
Stop	0 Degree
Left	30 Degree left
Right	30 degree right

Fig 10: *Direction of movement of wheelchair on minimum threshold angle*

The wheelchair advances in forward motion when both of its wheels rotate in that direction. The wheelchair goes backward when both wheels rotate in the opposite way. The wheelchair moves in the right direction when the left motor turns and the right motor shaft remains motionless, and in the left direction when the left motor revolves and the wheelchair remains stationary.

VIII. FUTURE SCOPE

The wheelchair that uses hand gestures can help close the gap between humans and machines. For those whose entire body is paralyzed, this hand gesture can also be converted to voice and brain signal recognition, which will be a decisive

advantage in battle. Wheelchairs may be made more precisely and inexpensively, and they can be powered by a
cordless remote control with a variety of sensors. It is possible to use a variety of sensors, combine their inputs, and process the results. Wheelchairs can be equipped with additional safety features, such as an ultrasonic sensor for object detection.

IX. CONCLUSION

Wheelchair users can move the chair in line with their gestures and it is completely capable of supporting loads up to 110 kg. It is possible to make the wheelchair more accessible for people whose entire body is paralyzed by making some improvements and improvisations. The wheelchair system can be improved by imparting certain eye gestures or brain impulses to the reader.

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