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"Head-Motion Controlled Wheel Chair Direction Using ATMega328p Microcontroller"

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Abstract: Wheelchair is a device used to move physically challenged people or patients from one place to another who are unable to walk by themselves. The main aim of this paper is to prepare a Head-Motion Controlled Wheelchair for physically disabled people who cannot move by their own. Electric wheelchair are very expensive and costs more than 60000 Rupees. Standard wheelchairs are controlled manually by means of other persons or self-propelling. Head-Motion Controlled Wheelchair is an electric wheelchair which can be controlled by head movements of the patients or physically challenged people and does not require any effort as it works electric motors. Accelerometer is used to sense the forward and backward movement of head which can be used to control the wheelchair forward or backward respectively.

Keywords: Accelerometer Sensor, ATMega328p Arduino Microcontroller, 300 rpm Johnson Gear Motor, RF Module.

I. INTRODUCTION

Now a days, many elderly and physically disabled people need wheelchairs to make their personal mobility easy so for them wheelchair is a suitable device. By using wheelchair they can move from one place to another effortlessly. By using standard wheelchairs, it requires another person's help or by self-propelling.

These problems can be overcome by using electric wheelchairs or joystick controlled wheelchair. Generally, Electric Wheelchairs cost ranges from 50000 and more [1]. This Head-motion controlled Wheelchair is way cheaper than Electric or Joystick controlled wheelchair available in market.

The Head-motion Controlled Wheelchair is far better than conventional Wheelchairs. The conventional joystick wheelchair requires hand motion for controlling which are not suitable for physically handicapped peoples. But Head-motion controlled wheelchair is suitable for those whose hands or fingers are paralyzed as it requires head motion. Rather than these, the head-motion controlled wheelchair is far cheaper than joystick wheelchairs.

This paper investigates the research work of Head-motion controlled wheelchair for the user interaction. Gesture type, interface, technology used, user types, issues, problems, advantages and final result have been listed and described to give background of Wheel Chair based technology development.

In this Wheel Chair, we use MPU6050 accelerometer for movement sensing. In this technology, we connect accelerometer to ear-set, which is connected to Arduino Nano. This Arduino Nano is connected to transmitter side of Radio-Frequency module which uses 433 MHz frequency for communication with Receiver side. This Receiver side is connected with Wheel-Chair Motor for movement control of Wheel Chair.

For this project, Accelerometer MPU6050 is attached to ear-set, which is will detect the motion of head. This accelerometer, works on X-Y axis, so when the head is moved forward or backward, or left or right, this change the axis of accelerometer from its reference point. Then, this data is transferred to Arduino Nano, which is using ATMega328p micro controller, and Arduino sends this signal from Transmitter side of Radio-Frequency Module.

On the other side, at Receiver end, that is our Wheel-Chair, Radio-Frequency Receiver Module is connected to Arduino Uno. The signal is received to the Receiver Module, and sent to Arduino Uno. The Arduino Uno is interfaced with L298N 2A based H- Bridge Dual Motor Driver. Then, Arduino Uno sends signal to Motor Driver, and these

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signals are based on the Signals received from Radio-Frequency Module. Arduino sends Interrupt signal to the pins of Motor driver. This activates the motor and hence the Wheel-Chair moves according to the head movements.

II. LITERATURE REVIEW

- According to research paper, "HAND GESTURE RECOGNITION: A LITERATURE REVIEW"[2], it focuses on human computer interaction. It is a survey of recent hand gesture recognition systems. Key issues of hand gesture recognition system are presented with challenges of gesture system. Review methods of recent postures and gestures recognition system presented as well.

Orientation histogram method applied in this have some problems which are; similar gestures might have different orientation histograms and different gestures could have similar orientation histograms, besides that, the proposed method achieved well for any objects that dominate the image even if it is not the hand gesture.

- According to research paper, Titled"IR Sensor-Based Gesture Control Wheelchair" [3] published in IEEE,it works on the principle of gesture recognition by using Infrared Sensors.In this method, IR sensors are used for identifying the simple gestures to control the powered wheelchair to move in any direction. In the proposed prototype system, a gesture pad that includes IR sensors, MCU and power management circuit is designed for gesture recognition and identification and a controller for driving motors is implemented.

The main problem that comes with IR is during daylight, its sensitivity is reduced, and hence causing problem for processing the further programs. And it is difficult to recognise exact gestures using IR sensors.

- In research paper published, entitled, "Electric Powered Wheelchairs",[4]its aim was to review the concepts and previous work on velocity control, traction control, suspension control, stability control, stair-climbing wheelchairs, and wheelchair navigation. The information gathered in this study is intended to promote awareness of the status of contemporary powered wheelchair control technology and increase the functional mobility of people who use EPWs.

But, it has a major disadvantage of cost efficiency. It's quite expensive as compared to normal wheel-chair.

- In an article [5], from Int. Journal of Engineering Research and Applications, aims at gesture control wheelchair using hand movements. According to this article, with hand movements, wheelchair's direction can be changed. But it has disadvantage over paralysed patients, who cannot move their hands.

- We are using accelerometer, mounted to the ear piece, so that with movement in head, or say, by moving your head, slightly in different direction, we can move the direction of wheel-chair.

III. METHODOLOGY

The main concept for this Head Motion controlled wheelchair is using gesture recognition with accelerometer, but the accelerometer is mounted in the ear piece to detect the motion of head in all axis. We are using electric wheel chair and controlling it using Arduino microcontroller. The Method used in this Head motion controlled Wheelchair is divided into two parts. One is transmitter side and other one is receiver. The transmitter side sends the accelerometer data to receiver through Radio frequency. The transmitter side mainly consist of three parts Arduino Nano, Accelerometer MPU6050 and RF transmitter.

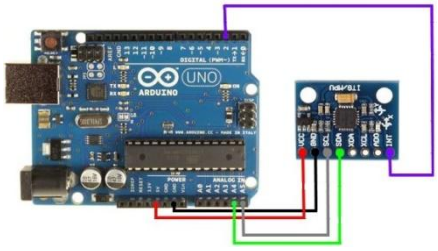

Fig 3.1: *Accelerometer MPU6050 Module*

The accelerometer used in this wheelchair is MPU6050, which is 3 axis gyroscope and 3 axis accelerometer. In this Head motion controlled wheelchair we only used 2 axis for controlling forward, backward, left and right directions of wheelchair. The accelerometer sends the x and y coordinates to Arduino Nano microcontroller. Then this

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micro controller reads the signal received, and as per the given code, it processes and transmits signal using Radio Frequency Transmitter Module, using 433MHz of frequency.

Figure 3.1, shows the circuit diagram for connecting HT12E IC with RF transmitter.

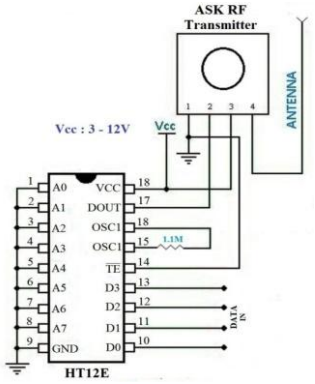

Fig3.1:*Transmitter Side of R-F Module*

The Figure 3.2 shows RF Receiver Circuit of Head Controlled Wheel Chair.

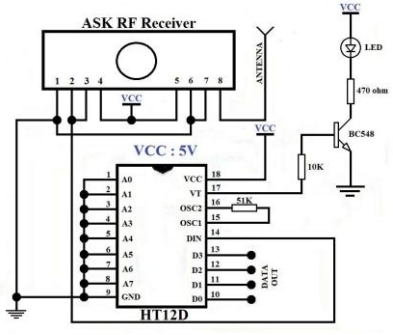

Fig 3.2:*Receiver Side of R-F Module*

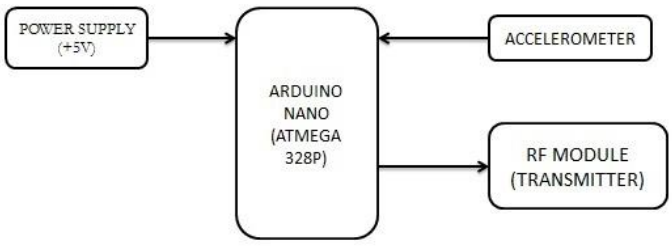

Fig: Transmitter of Head Controlled Wheel-Chair

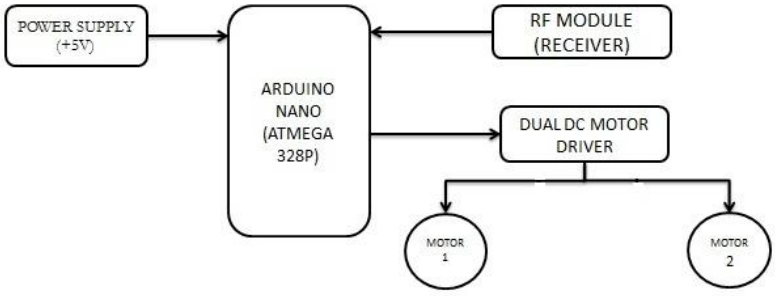

Fig: Receiver of Head Controlled Wheel-Chair

Fig 3.4 *Block Diagram of Head-Motion controlled wheel chair*

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As the input signal received from accelerometer, and processed through Arduino Nano micro controller, this micro controller encodes the signal through HT12E encoder IC, and this coded signal is then transferred to the Transmitter Module. With the help of antenna, Transmitter side of Radio Frequency module uses 433 MHz frequency and sends the code. Then at receiver end, that is our wheel chair, Receiver Side of R-F module is connected. This Receives the 433MHz signals transmitted from Transmitter antenna. This received signal is them decoded with the help of HT12D decoder IC. Then the decoded signal is feeded to the Arduino Uno micro controller.

The main part of this Head Motion Controlled Wheelchair is in the Receiver side. It contains all the Motors and driver for operating Wheelchair. The Data from RF transmitter is decoded to RF receiver via HT12D decoder IC. This RF receiver sends the data to Arduino Uno. The Arduino Uno trips the motor driver accordingly, which starts the Motors for forward, backward, left or right direction motion.

The Motor driver uses L298N IC to modulate the supply by giving interrupt signal to the driver module. Arduino is programmed to switch the interrupt signals on the driver module. By giving Interrupt signal, we can change the polarity of motor and hence change the direction of motor.

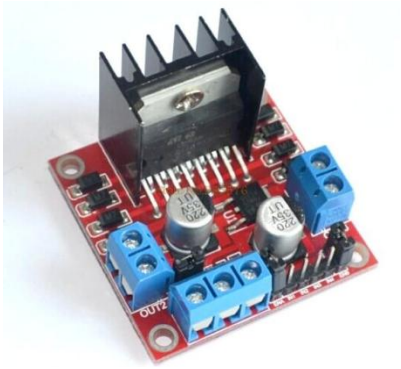

Fig 3.4: *L298N H-Bridge Dual Motor Driver*

The Motor used in this Wheelchair is Johnsons 300 rpm high torque DC motor, which has a torque of 30 kg/cm. These motor are operated by L298N H- Bridge Dual Motor driver which operates the motor in desired direction accordingly. This L298d motor driver is based on dual H bridge Motor driver IC, through which we can easily connect and control two motors of 2A in each direction.

IV. APPLICATION

- **In Hospitals for handicapped patients:** Some patients that cannot manipulate the wheelchair with their arms due to a lack of force or psychomotor problems in the superior members require electric wheelchair. The wheelchair is operated with the help of accelerometer, which in turn controls the wheelchair with the help of head movement. The wheelchair moves front, back, right and left. Due to which disabled and partially paralyzed patient can freely move. And even the patient, whose arms are injured or lost, can operate this wheelchair with their head movements. This is the main advantage of having Head-Motion controlled wheelchair.

- For handicapped patient, or elderly people, it can be very efficient as it is wireless. If the patient or user is in bed, and need Wheel chair. So he can be independently use the wheel chair by using controller. As it is wireless and uses Radio Frequency, that's why it has a wide range.

V. RESULT

COMPONENTS	SUPPLIED VOLTAGE
Motors (Johnson 300 RPM, 30 kg/cm Torque)	11.86V DC
RF Module (Transmitter and Receiver)	4.56V DC
MPU6050	4.56V DC
Arduino	9V DC
Motor Driver (L298N)	11.86V

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VI. CONCLUSION

This survey is the accomplishment of the task where gesture controlled user interface for elderly and disable people has been. From this survey it has been identified that elderly and disable needs more technology support using their nature behaviour, considering their limitations. We can use affordable technology for daily activities.

The wheelchair is fully capable of carrying the load up to 110Kg, and moving in accordance to the head gesture given by the person who is using the wheel chair. Certain improvisation and improvement can be done to make the wheelchair more reachable to those whose whole body is paralyzed. Certain eyes gesture or brain signals reader can be imparted on the wheelchair system so as to make it better. For now, it works for all kind of disabled or elderly person, and even for those patients whose whole body is paralysed but still head movement is possible.

VII. FUTURE SCOPE

Technologies developed based on gesture are now really affordable and converged with familiar and popular technologies like TV, large screen. It's ubiquitous and nonintrusive as we can install a camera or remote with the TV. From this paper we can see the trends of gesture controlled communication systems. Easing of the technology use, affordability and familiarity indicate that gesture based user interface can open new opportunity for elderly and disable people.

Voice monitoring helps the disabled person to determine the obstacle by acknowledging with alarm signals. That can act as motor kill switch.

REFERENCES

[1] Pushpendra Jhaand Preeti Khurana, "Hand Gesture Controlled Wheelchair", I J C T A, 9(41), 2016, pp. 243-249.
[2] Rafiqul Zaman Khan and Noor Adnan Ibraheem, "HAND GESTURE RECOGNITION: A LITERATURE REVIEW", International Journal of Artificial Intelligence & Applications (IJAIA), Vol.3, No.4, July 2012.
[3]Rajesh Kannan Megalingam, Venkat Rangan, Sujin Krishnan, Athul Balan Edichery Alinkeezhil, "IR Sensor-Based Gesture Control Wheelchair for Stroke and SCI Patients", IEEE Sensors Journal (Volume: 16, Issue: 17, Sept.1, 2016).
[4] D. Ding, and R.A. Cooper, "Electric Powered Wheel-Chair", IEEE Control Systems (Volume: 25, Issue: 2, April 2005).
[5] Prof. Vishal V. Pande, Nikita S.Ubale, Darshana P. Masurkar, Nikita R. Ingole, Pragati P. Mane, "Hand Gesture Based Wheelchair Movement Control for Disabled Person Using MEMS.", Int. Journal of Engineering Research and Applications, www.ijera.com, ISSN : 2248-9622, Vol. 4, Issue 4(Version 4), April 2014, pp.152-158.

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