

# Wheelchair Controlled by Head Movement

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**Abstract**—In this quick moving, ravenous world, individuals need to refresh and create themselves. Individuals with Quadriplegia cannot move any of their appendages and are hence constrained in their capacities of interfacing with their condition. In any case, a significant number of them can even now move their heads which can be used for the improvement of assistive gadgets. This sort of clients experiencing quadriplegia requires exceptional wheelchairs as opposed to utilizing customary ones that are constrained by joystick, since they are incapacitated underneath their neck. This undertaking plans to head direction controlled savvy wheelchair so as to improve their everyday exercises of living, with no help. The proposed framework utilizes accelerometer module which is given to Arduino Nano. As per the orders, wheelchair moves. Alongside obstruction recognition is likewise done utilizing ultrasonic sensor. Patient monitoring framework incorporates temperature and pulse estimation with informing administration by means of worldwide framework versatile communication (GSM).

**Index Terms**—Arduino Nano, GSM, Quadriplegia, Ultrasonic sensor, Accelerometer (ADXL335), RF 433MHz, Head Movement.

## I. INTRODUCTION

Quadriplegics are people who can't utilize any of the furthest points. The purposes behind such diminished movement prospects can be unique: stroke, joint pain, hypertension, degenerative sicknesses of bones and joints and instances of loss of motion and birth abandons. Likewise, quadriplegia shows up as a result of mishaps or age. The patients with such serious incapacities can't play out their ordinary activities, for example, taking care of, and development through space. Contingent upon the seriousness of the incapacity, a patient can hold opportunity of development to a specific level by utilizing diverse clinical gadgets. Versatility has gotten significant for a decent personal satisfaction.

Arranging a system with free versatility for such debilitated people is our point in this endeavor. We target planning a straightforward savvy wheelchair constrained by head development which additionally incorporates patient monitoring framework and obstacle detection framework. This wheelchair incorporates ADXL335 sensor, ultrasonic sensor, pulse sensor, temperature sensor, battery, dc motor, GSM module and Arduino Nano microcontroller. ADXL335 which is used for perceiving the tilt. This sensor finds the tilt and alters the Course of

the wheel chair relying upon tilt. The ultrasonic sensor assists with staying away from deterrents, utilizing nature data assembled during route. Observing is accomplished by temperature sensor and heartbeat sensor and the detected values is given to microcontroller. At whatever point the boundary surpasses the edge esteem, an alarm message is sent to the specialist's telephone utilizing GSM module. The normal result of the undertaking is the framework utilizes head development to control the wheelchair and patient monitoring is achieved.

## METHODOLOGY

The Transmitter and Receiver block diagram portrays the execution of a wheelchair with head controlled development, quiet checking framework and impediment recognition. This plan is predominantly created for quadriplegia patients. In this venture, the head controlled development assists with moving the wheelchair a particular way. The patient monitoring framework assists with estimating the pulse and temperature of the patient. The obstacle detection framework assists with distinguishing the deterrent in a navigational way and stops the wheelchair when hindrance is identified.

### Transmitter Section

The Transmitter side mainly consists of three parts, Arduino Nano Microcontroller, Accelerometer, RF 433MHz Transmitter.



Fig. 1. Transmitter Section.

### Accelerometer

The head development module has been founded by utilizing a triple pivot accelerometer sensor (ADXL 335). the widely minimal effort sensor gives the knowledge to the direction of the pinnacle. The accelerometer sensor senses the accelerating force (acceleration because of gravity) and during this manner gives a selected voltage for the x and y co-ordinate direction. Yield of ADXL335

is gotten at Xout, and Yout. These pins are related to the ADC pins of the microcontroller. Accelerometer placed on the patient's head detects the event made by the patient. This development compares to the straightforward

voltage.

• **ArduinoNano**

The proposed structure utilizes Arduino Nano Micro-controller. Arduino Nano is a small and breadboard-accommodating board dependent on the ATmega328 (Arduino Nano 3.0). The Arduino Nano can be fueled by means of the Small scale B USB association, 6-20V unregulated outside force gracefully (pin 30), or 5V directed outer force flexibly (pin 27). The forcesource is naturally chosen to the most elevated voltage source. It has 14 Digital Input/Output Pins (of which 6 provide PWM output) and 8 Analog Input Pins. The microcontroller creates control sign to drive engines of wheelchair.

• **RF 433MHzModule**

RF Transceiver Module gives a total RF transmitter and recipient module arrangement which can be utilized to transmit information at up to 3KHz from any standard CMOS/TTL source. Atransmittermoduleisextremelyeasytoworkand offers low current utilization (average. 11mA). Information can be provided legitimately from a chip or encoding gadget, consequently keeping the segment tally down and guar- anteeing a low equipmentcost.

*B. ReceiverSection*

A fundamental piece of this Head Movement Controlled Wheelchair is in the Recipient side. It contains all the motors and driver for working Wheelchair.

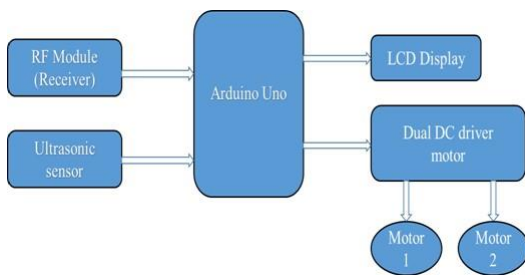


Fig. 2. Receiver Section.

• **UltrasonicSensor**

HC-SR04 ultrasonic going sensor is utilized for deterrent recognition. This judicious sensor offers 2cm to 400cm of non-contact estimation handiness with a running pre- cision that can reach up to 3mm. Each HC-SR04 module joins a ultrasonic transmitter, a recipient and a control circuit.

There are four pins on HC-SR04:

VCC, Trigger, Echo, Ground

(1) Utilizing IO trigger for at any rate 10us elevated level sign. The Module normally sends eight 40 kHz and recog- nizewhetherthereisaheartbeatsignalback.

(2)In the event that the sign is restored, through enormous level, time of exceptional yield IO long. This obstacle detection has two conditions. The main, the nearness of the deterrent in the

navigational way then the wheelchair stops. The second is without snag in a navigational way thenthewheelchairkeepsonmoving.

• **DCMotor**

A DC engine produces force by making a connection between a fixed and pivoting magnet field. Thefixed field is provided by high vitality changeless magnets. The turning field is made by passing a DC current through a few unique windings on the armature (pivoting part) and timing which winding is controlled through a gadget called a commutator. Force is applied to the armature by brushes which ride on the commutator. An electro mechanical vitality transformation gadget is basically a modeofmovebetweenaninfosideandayieldside.

ThevitalitychangeinaDCengine resembles;ifelectrical vitality is provided to a conduit lying opposite to an attractive field, the association of flow streaming in the transmitter and the attractive field will delivermechanical vitality aspower.

• **DualDCH-BridgeMotorDriverCircuit**

A H Bridge is an electronic circuit that permits a voltage to be applied over a heap toward any path. H Bridge circuits are as often as possible utilized in mechanical technology and numerous different applications to permit DC engines to run forward and in reverse.

L293DICisanormalEngineDriverICwhichpermits the DC engine to drive on any course. This IC comprises of 16-pins which are utilized to control two DC engines momentarily toward any path. Single L293D IC comprises of two H-connect circuits inside which can pivot two DC engines independently. By and large, these circuits are utilized in mechanical autonomy because of its size for controlling DCengines.

*C. PatientMonitoring*

Real time monitoring of the patient's health condition can be done with the assistance of patient monitoring framework.



Fig. 3. Patient Monitoring Section.

• **GSMModule**

The message sending process is finished by the GSM framework. This framework is known as the Worldwide Framework Versatile correspondence framework. The in- formation move rate is high and simple exchange. GSM is a cell arrange, which implies that cell phones associate withitviascanningforcellsinthequickregion. There are five diverse cell sizes in a GSM network Macro, Micro, pico, and femto cells.

The proposed framework utilizes GSM Sim 800C Mod- ule.

- Heart Rate Measurement

In this proposed structure heart beat is evaluated using Heartbeat sensor. The sensor has various sides, on one side the drive is set close by an encompassing light sensor and on the contrary side we have some equipment. This equipment is liable for the improvement and disturbance clearing out work. The drive on the front side of the sensor is put over a vein in our human body. It should be put direct on a vein. Directly the drive exudes light which will fall on the vein clearly. The veins will have circulatory system inside them exactly when the heart is siphoning, so in case we screen the movement of blood we can screen the heart throbs as well. If the movement of blood is recognized, by then the encompassing light sensor will pickup lighter since they will be reflected by the blood, this minor change in got light is analyzed after some ideal opportunity to choose our heart pounds.

- Temperature Estimation

The proposed framework utilizes LM35 sensor for temperature estimation. The LM35 sensor is a precision composed circuit temperature contraption with a yield voltage legitimately comparative with the Centigrade temperature. LM35 is a simple straight temperature sensor. Its yield is corresponding to the temperature (in degree Celsius). The working temperature stretch out is from - 55°C to 150°C. The yield voltage shifts by 10mV considering each °C rise or fall in temperature. It tends to be worked from a 5V just as 3.3 V flexibly and the backup current is under 60uA.

## II. WORKING PROCEDURE

The undertaking comprise proposition of head development controlled wheelchair. The above proposed work takes focal points of both 3 axis accelerometer innovation and patient monitoring framework empowering patients to move their wheelchair by simply inclining accelerometer and patient's body parameters are measured.

The Transmitter side has an accelerometer for the head movement acknowledgment and Arduino Nano is utilized as a microcontroller. The accelerometer sends the x and y directions to Arduino Nano microcontroller. At that point this microcontroller uses the signal, and according to the given code, it transmits signal utilizing radio frequency transmitter module, utilizing 433MHz of frequency. With the assistance of reception apparatus, transmitter sends the code to the recipient end.

At the recipient end radio frequency receiver module is associated with Arduino Uno microcontroller. This gets and forms the 433MHz signals transmitted from

transmitter. The yield of the microcontroller is associated with the mechanical motors, which is utilized to drive the wheelchair as per the user's command. Along these lines, user's head movement is converted into mechanical movement of the motor.

In this proposed venture obstruction recognition is likewise included. The ultrasonic sensor is utilized for hindrance recognition. Ultrasonic sensors information is prepared by the code executed inside the microcontroller, at whatever point there is hindrance in the scope of 50 cm, the wheelchair stops.

Patient monitoring is likewise consolidated in this task which incorporates temperature sensor, pulse sensor and GSM module. The patient's temperature and heartbeat rate is shown on LCD. At the point when the estimation of temperature is more noteworthy than 37 degree celsius message is sent to the doctor notice "Alert ! Temperature has crossed the edge". At the point when the beat rate is under 60 bpm message is sent to the specialist notice "Alert ! Heartbeat is not as much as limit", and correspondingly when heartbeat rate goes over 120 bpm "Alert ! Heartbeat has crossed the limit" message is sent to doctor by means of GSM module.

## APPLICATIONS

In Hospitals Some patient's who can't control the wheelchair with their arms because of an absence of force. The wheelchair is worked with the help of accelerometer, which in this manner controls the wheelchair with the help of head movement. The weakened and mostly stifled patients can uninhibitedly move and even the patient whose arms are hurt, can work this wheelchair with their head movements.

### Virtual game simulation

Virtual games can be constrained by the head movement of the player to improve the experience of a player playing the games. The movement of the objects on the screen can be controlled.

### Giving PC Access to Debilitated

The different blends of head movements, are utilized to outline different sorts of mouse occasions, for example, move, snap and drag to up, down, left, right, etc. The HMD framework can be utilized for the upper appendage impaired individuals who failed to utilize the customary mouse and console of PC.

### Old Age Homes

Individuals at mature age homes can utilize this seat according to their prerequisite.

## ADVANTAGES

- Expanded portability, for handicapped individuals who can't utilize their arms to control a manual wheelchair.

- Easy to use.
- It is lightweight.
- Motorized wheelchair with front line control.
- Solid and practical structure.
- Decreases human action and physical strain.

#### DISADVANTAGES

- It requires external power supply.
- It is constrained to indoor condition.

### III. RESULT AND CONCLUSION

The proposed framework is expected to make a financially savvy wheelchair to assist quadriplegic with people who think that it's hard to move freely. The structure uses head advancement to control the wheelchair. The tilt focuses made are distinguished and voltages are created by accelerometer. These voltages are taken by microcontroller which in this way controls the course of wheelchair.



Fig. 4. Prototype of the Wheelchair

This venture work was carried on to satisfy the prerequisite of older and impair individuals, giving the autonomous route utilizing head movement controlled wheelchair. It causes them to move effectively as like ordinary people do. The circuit works appropriately to the order given by the user and the wheelchair is moved in understanding to the head signal given by the individual. Head movement controlled wheelchair incorporates obstacle detection, which assists with distinguishing the hindrance and stops the wheelchair. Monitoring of the patient's wellbeing condition is possible with the assistance of patient monitoring framework.

### IV. FUTURE SCOPE

#### Mind control:

Controlling wheelchair by the electric sign created from mind. As our cerebrum contains a great many neuron, there is sure likely distinction between every neuron. At the point when we think something neuron radiates 0 to 50 Hz electric sign. By deciphering the sign by demodulation, we can control the chair.

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