International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 05 | May 2021 www.irjet.net p-ISSN: 2395-0072

CORIOLIS ACCELERATION BASED HEAD GESTURE CONTROL SYSTEM FOR A SMART WHEELCHAIR

ALBIN ABRAHAM[1], KIRAN RAMESH[2],V. MONISH[3], Dr .D.R.P. RAJARATHNAM. M.E..,PhD[4]

[1,2,3]Department of Mechatronics, Paavai Engineering College, Pachal, Namakkal.
[4]Assistant Professor, Department of Mechatronics, Paavai Engineering College, Pachal, Namakkal.

Abstract - *Smart wheelchair is a robotic system having the ability to navigate based on the Head gesture recognition technique. This smart system is controlled by various sensors and artificial intelligence techniques. The wheelchair can move forward, backward, left and right according to the directions from the ADXL 335 sensor which is controlled by the Arduino UNO. Tracking and monitoring the patients condition is made easier by making use of GPS and heartbeat sensors.*

Key Words**: Arduino, Smart wheelchair, ADXL 335, artificial intelligence, gps, heart beat sensor.**

1. INTRODUCTION

The emerging technologies and developments have a great influence in our day to day life. In our project we are trying to make use of these advancement for human requirements. The main objective of our project is to develop a Smart wheelchair which can be easily accessible by the paralytic patients. These people's become more isolated and has to depend on other's for their needs. Their social freedom is reduced. Robotics plays an important role in this developing world. A Smart wheelchair is a guidance system for them. In this system a head motion module is introduced to control the directions of the wheelchair. Effective tracking and monitoring also done which is totally controlled by the microcontroller. The components used are Arduino UNO, ADXL 335, Motor driver, HCSR-04, GPS and GSM modules, Heartbeat sensor, DC motors.

2. METHODOLOGY

Arduino is an open source platform and we can do so many projects with the use of it. In this system, we use it as a central processing unit of the robotic system. The ADXL 335 senses the movement of our head which is fitted in the cap of the patient. Arduino recieves the input signals which is trapped by the accelerometer sensor and it is analysed by the microcontroller to take the decisions. Based on these signals the wheelchair movement is controlled. The HCSR-04 is employed to detect the obstacles to avoid unnecessary damage and collisions of wheelchair. While in an emergency situation the smart wheelchair is equipped with a global positioning system through which we can locate the coordinates of the patient and provide immediate assistance.

3. WORKING

Arduino UNO has 6 analog input pins (A0-A5) and 14 digital I/O pins of which 6 provide PWM output. The operating voltage is 5V and having a flash memory of 32 kb. We use it as a central processing unit of our intelligent robotic system. All the requirements are already pre-programmed in the microcontroller using the software Arduino IDE. The ADXL 335 ie, the accelerometer sensor is connected to the analog port of the UNO. We use it to transmit the signals. The signals are given as input from the accelerometer sensor to the microcontroller which inturns controls the wheelchair movement. If patient tilt his head in right or left direction, the chair will move in right or left direction. In the same way if the person tilts his head up or down, the chair will move in forward and backward directions.

The movement of the wheelchair is made possible using the dc motors. The dc motors are connected with the motor driver (L293D) which enables the driving of two dc motors at a time. The inputs are recieved from the Arduino UNO and thus the motor driver take the motion possible.

OPERATING STAGES

The working of the smart wheelchair comprising of two stages.

1. Wheelchair locomotion

2. Tracking and monitoring

1. WHEELCHAIR LOCOMOTION

In this operating stage the accelerator sensor takes the overall control of this smart wheelchair. According to the tilt movement of our head the directions are received and analysed by the microcontroller to take the control. Thus the following data's will be sent to the Arduino UNO.

• Ax = Accelerometer X-axis data

• Ay = Accelerometer Y-axis data

• Az = Accelerometer Z-axis data

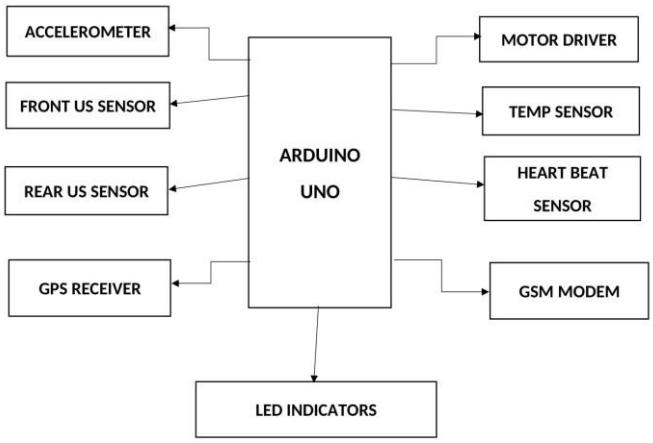
The ADXL 335 sensor measures the values of three axis and it is transferred to the microcontroller. By analysing the tilt movement and verifying the data's it allows the motion in RIGHT, LEFT, FRONT, BACK direction. At the same time the ultrasonic sensor reads the signals and detects any obstacles in the moving path. when an obtacle is identified by the sensor it transmits the signals to the controller to stop the wheelchair movement. And if the path is clear it continues its motion depending on the human ease.

2. TRACKING AND MONITORING.

Effective tracking and monitoring is also equipped with this intelligent robotic system. Whenever the patient is in an emergency situation the coordinates of the location is send to the phone number which is pre-programmed in the microcontroller. Thus we can track the location using the gps and GSM modules.

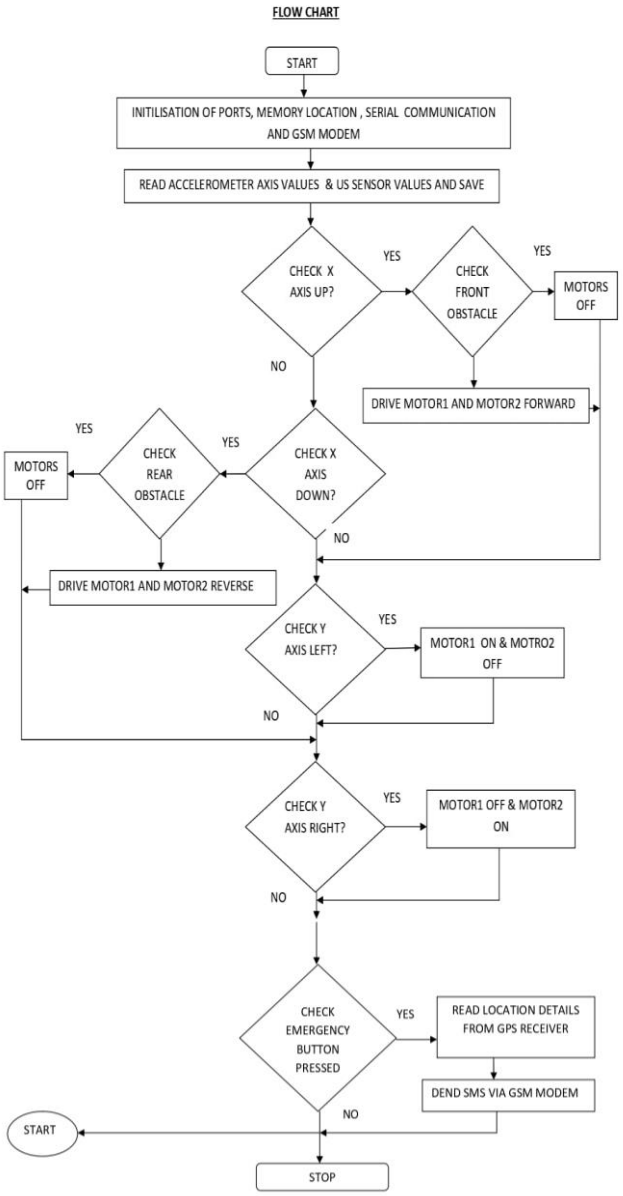
In addition to this the health conditions of the patient is continuously being monitored using the heart beat sensor and temperature sensor. When there is an irregular variations is noticed we can provide the emergency health assistance to theses people's.

BLOCK DIAGRAM



This block diagram explain the working of this project.

FLOW CHART



4. CONCLUSIONS

Our proposed model of this Smart wheelchair could give satisfactory results for paralytic patients. The input signals are captured and successfully transferred to the controller by the ADXL 335 sensor. Our Smart wheelchair could overcome the drawbacks of existing wheelchairs. Effective tracking and monitoring techniques provides a better guidance and makes the system a suitable gadget for the paralytic one's.

REFERENCES

[1] Development of Wheeled Balancing Wheelchair for Lower Limb Disabled Person: Design of Wheelchair Platform Seonghee Jeong1 and Kazuki Kozai2 1Division of Mechanical and Control Engineering, O.E.C.Univ., Osaka 572-8530, Japan.

[2] 2. R K Megalingam, C Chako, — Gesture Controlled WheelChair using IR-LED-TSOP pairs along with Collision Avoidance.‖ Int. Conf. on Robotics and Automation for Humanitarian Applications (RAHA) 2016.

[3] 3. Development of the Control System of Voice-Operated Wheelchair with Multi-posture Characteristics. Duojin Wang, Hongliu Yu Shanghai Engineering Research Center of Assistive Devices Institute of Rehabilitation Engineering and technology University of Shanghai for Science and Technology Shanghai, China.

[4] 4. Design and Development of a Smart Wheelchair with Multiple Control Interfaces. H. G. M. T. Yashoda, A. M. S. Piumal, P. G. S. P. Polgahapitiya, M. M. M. Mubeen, M. A. V. J. Muthugala and A. G. B. P. Jayasekara Department of Electrical Engineering University of Moratuwa.

[5] 5. Dr.AntoBennet, M, Suresh R, Mohamed Sulaiman S, —Performance &analysis of automated removal of head movement artifacts in EEG using brain computer interface‖, Journal of Chemical and Pharmaceutical Research 07(08): 291-299, August 2015.

[6] 6. Rajesh Kannan Megalingam, Sai Monoj Prakhya, Ramesh Nammily Nair and Mithun Mohan, ‗‗Unconventional Indoor Navigation: Gesture Based Wheelchair Control‘‘,2011 International Conference on Indoor Positioning and Indoor Navigation (IPIN).