International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 02 | Feb-2016 www.irjet.net p-ISSN: 2395-0072

# INTELLIGENT WHEEL CHAIR USING GESTURE RECOGNITION

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## *ABSTRACT*

*There is a different level of disable peoples has different problem to propel wheelchair especially physically handicapped. Manual wheel chair is a wheel chair which doesn't have any collision protection and if there is any blind person on wheel chair then there is a possibility of accidents or collision, such constraints need to solve. We have proposed a modified automated wheel chair with collision or accident protection using some advance sensor to detect obstacle and some unwanted interruptions along with vibration indication and chair movement control using MEMS (Micro Electro Mechanical Sensor) sensor to provide an easier way to operating the wheel chair.*

***Keywords*: Arduino Mega2560, Mems Sencor, RTC, Obstacle detector, Announcing Module,Heartbit Sensor.**

## I. INTRODUCTION

The aim of this project is to use wheelchair automatically for moving forward, backward, Left & Right. The overall framework of this project is to restore autonomy to severely Disabled people by helping them use independently a power wheelchair. A wheelchair is an electric wheelchair fitted with acceleration sensors, obstacle sensor and computer to help less able drivers achieve some independent mobility. By just tilting acceleration sensor wheelchair can be moved in four directions. The obstacle sensor can help the rider control the wheelchair by taking over some of the responsibility for steering and avoiding objects until he or she is able to handle the job. The amount of work that the rider chooses to do and how much control is taken by the chair is decided by the rider and his or her care. Obstacle in the way can be determined by wheelchair and wheelchair will stop automatically. The wheelchair can also integrate with Head movements and computers; the pilot can use the same controls to drive the wheelchair and operate another assistive device, so handicap person who cannot make use of his hands can drive chair by ideal solution is the use of a sensor. Our project handicap wheelchair basically works on the principle of acceleration, one acceleration sensor, provides two axes, acceleration sensors whose output is analogs, varies according to acceleration applied to it, by applying simple formula we calculate the amount of tilt & output of tilt will decide to move in which direction. These various types include 3 mobility scooters, track based stair climbers, clustered wheel concept and caterpillar wheel based devices. A mechanism is proposed which is based on the use of four wheels. The rear wheels are autonomously driven and front wheels are freewheeling castors. This proposed concept is numerically modeled and power calculations for linear actuator are made. Stair ascent and stair descent operations are described along with figures and equations. The control system and the stair edge sensor system are also investigated. The stepping algorithm is discussed in detail. The influence of external factors like cost, weight, aesthetics, range of operation, safety, operational efficiency, comfort are evaluated. The track based stair climber is also analyzed similarly. Lock on discusses the retro fitting of electric power into manual wheelchairs.[1]

## II. NECESSITY OF PROJECT

The research and analysis of motorized wheelchairs dates back in time with several scientists and researchers evaluating the stair climbing mechanism. Ghani investigate the control of a stair climbing wheelchair used for indoor purposes. This paper evaluates different stair climbing mechanisms viz crawler type, leg type, hybrid type and wheeled type. The model of a stair climbing wheelchair based on two wheels is generated using MSC Visual Nastran 4D (VN) design software. The humanoid model is developed using requisite anthropometric data. Various forces and torques acting on the wheelchair while climbing the stairs are evaluated. Preferably, the outer support assembly comprises wheels on either side of the chair. An inner support assembly, closer to the centerline of the chair, also supports the seat assembly. Franco did work related to development of a stair climbing wheelchair that can move in structured and unstructured environments, climbing over obstacles and going up and down stairs. The wheelchair design is vividly elaborated. The wheelchair consists of a frame, seat and a linkage mechanism connecting the same. The frame consists of a chassis embedded with two motorized locomotion units, a support for two electrical gear-motors, two idle triple wheels units and a battery pack. The seat is a tubular structure that consists of a chair and a pivoting wheel. The linkage mechanism is responsible for relative motion between frame and seat during stair climbing operation. To successfully climb the stairs, it is required to move the seat backwards, then reorient it and finally lift up the pivoting wheel. When the seat is moved backwards, the center of mass of the wheelchair shifts to a safe position, and toppling is thus prevented. A four bar

linkage is appointed for the same. The linkage mechanism is actuated by a mini-motor connected to a lead screw device. When the seat reaches the desired position the motor is turned off and no extra energy is required to maintain the position. The customer requirements were studied and evaluated after referring them from the DLF (Disabled Living Foundation) factsheet. The factsheet aptly outlines what the user needs, wheelchair features, preliminary considerations before buying a wheelchair, wheelchair controls, how to negotiate curbs, specifications of batteries and chargers, special features of motorized wheelchairs, accessories of different types of wheelchairs as well as about insurance and customer requirements. Murray has elaborated the background as well as recent developments in mobility assistive mechanisms while discussing the relative importance of stairs and wheels. These various types include 3 mobility scooters, track based stair climbers, clustered wheel concept and caterpillar wheel based devices. A mechanism is proposed which is based on the use of four wheels. The rear wheels are autonomously driven and front wheels are freewheeling castors. This proposed concept is numerically modeled and power calculations for linear actuator are made. Stair ascent and stair descent operations are described along with figures and equations. The control system and the stair edge sensor system are also investigated. The stepping algorithm is discussed in detail. The influence of external factors like cost, weight, aesthetics, range of operation, safety, operational efficiency, comfort are evaluated. The track based stair climber is also analyzed similarly. Lock on discusses the retro fitting of electric power into manual wheelchairs.[3]

## III. IMPLEMENTATION

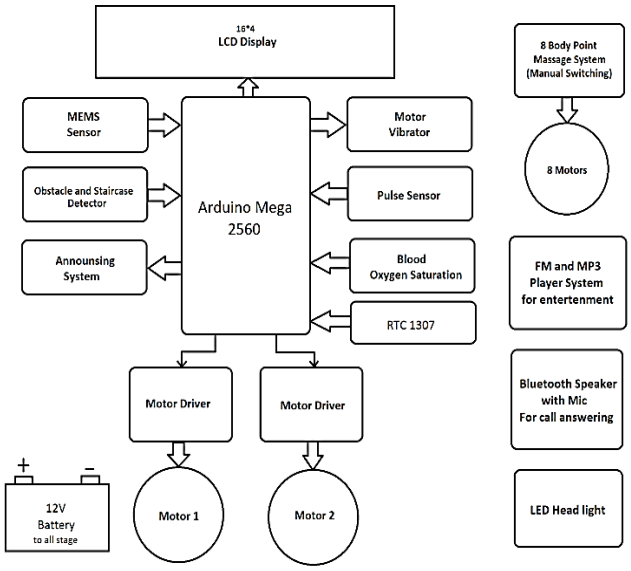


Fig.1.Block Diagram

## IV. HARDWARE DISCRIPTION

### A. ARDUNIO MEGA 2560

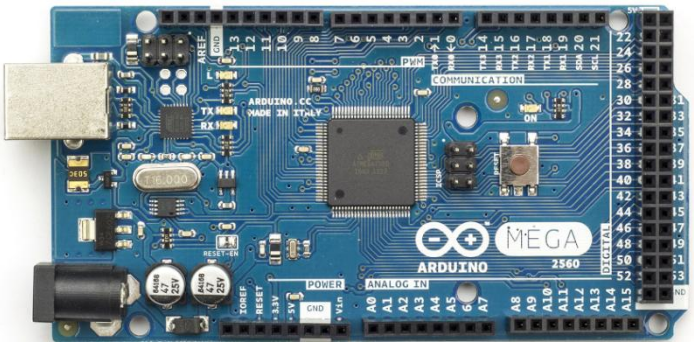


Fig.2.Ardunio Mega 2560

Above fig.2. is shows the Ardunio Mega 2560. This Ardunio Mega2560 is a microcontroller board based on the ATmega2560 It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Ardunio Duemilanove or Diecimila. The Mega has 16 analog inputs, each of which provides 10 bits of resolution (i.e. 1024 different values).

### B. MEMS SENSOR

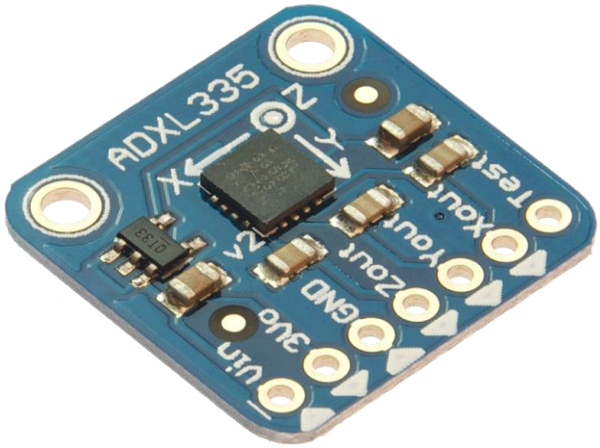


Fig.3.Mems Sensor

Above Fig.3. is shows the Mems sensor. This Mems Sensor is a Micro-Electro-Mechanical Systems, or MEMS, is a technology that can be defined as miniaturized mechanical and electro-mechanical elements that are made using the techniques of

micro-fabrication. An accelerometer is an electromechanical device used to measure acceleration forces. Such forces may be static, like the continuous force of gravity or, as is the case with many mobile devices, dynamic to sense movement or vibrations. Acceleration is the measurement of the change in velocity, or speed divided by time.

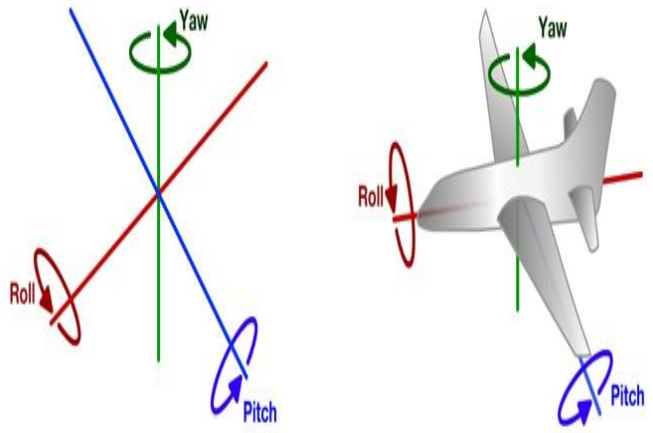


Fig.4.Mems Sensor Output

Above Fig.4. is shows the Mems sensor output. This Mems Sensor output is a Micro-Electro-Mechanical Systems, or MEMS, is a technology that can be defined as miniaturized mechanical and electro-mechanical elements that are made using the techniques of micro fabrication.

## C. DC GEARED MOTOR

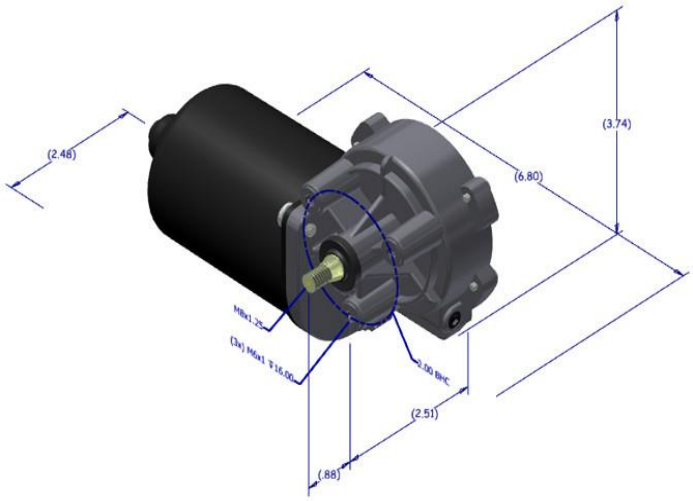


Fig.5.Dc Geared Motor

Above Fig.5. is shows the Dc Gear Motor. This Dc Gear Motor is Electric motors are broadly classified into two different categories: DC (Direct Current) and AC (Alternating Current). Within these categories are numerous types, each offering unique abilities that suit them well for specific applications? In most cases, regardless of type, electric motors consist of a stator (stationary field) and a rotor (the rotating field or armature) and operate through the interaction of magnetic flux and electric current to produce rotational speed and torque. DC motors are distinguished by their ability to operate from direct current.

## D. OBSTACLE DETECTOR

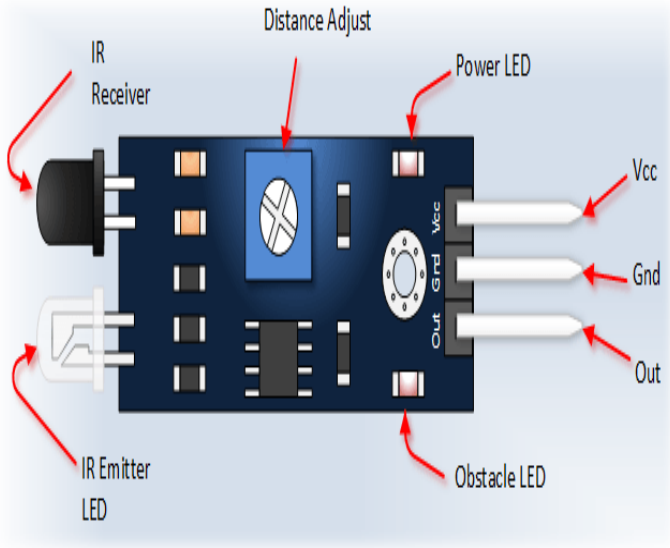


Fig.6.Obstacle Detector

Above Fig.6. is shows the Obstacle Detector. This Obstacle Detector is Based on a simple basic Idea, this IR obstacle is easy to build, easy to calibrate and still, it provides a detection range of 10- 30 cm. This sensor can be used for most indoor applications where no important ambient light is present. It is the same principle in ALL Infra-Red proximity sensors. The basic idea is to send infra red light through IR-LEDs, which is then reflected by any object in front of the sensor. It is the same principle in ALL Infra-Red proximity sensors. The basic idea is to send infra red light through IR-LEDs, which is then reflected by any object in front of the sensor. Then all you have to do is to pick-up the reflected IR light. For detecting the reflected IR light, we are going to use a very original technique: we are going to use another IR-LED, to detect the IR light that was emitted from another led off the exact same type! This is an electrical property of Light Emitting Diodes (LEDs) which is the fact that a led produces a voltage difference across its leads when it is subjected to light. As if it was a photo-cell, but with much lower output current. In

other words, the voltage generated by the leds can't be - in any way - used to generate electrical power from light, It can barely be detected. that's why as you will notice in the schematic, we are going to use a Op-Amp (operational Amplifier) to accurately detect very small voltage changes.

### E. ANNOUNCING MODULE (APR33A)

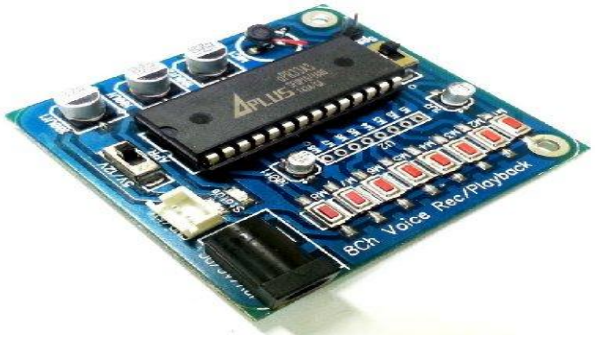


Fig.7.Announcing Module

Above Fig.7. is shows the Announcing Module. This Announcing Module is aPR33A series. The aPR33A Series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A series are a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality. The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because its integrated analog data converters and full suite of quality-enhancing features such as sample-rate converter. It is used to produce different voice according to condition can produce different eight type of pre-recorded voice having capability to record &play back using on board mic and speaker.

### F. HEART-BIT SENSOR

Above Fig.8. is shows the Heart-Bit Sensor. This Heart beat sensor is designed to give digital output of heat beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heart beat. This digital output can be connected to microcontroller directly to measure the Beats Per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse.

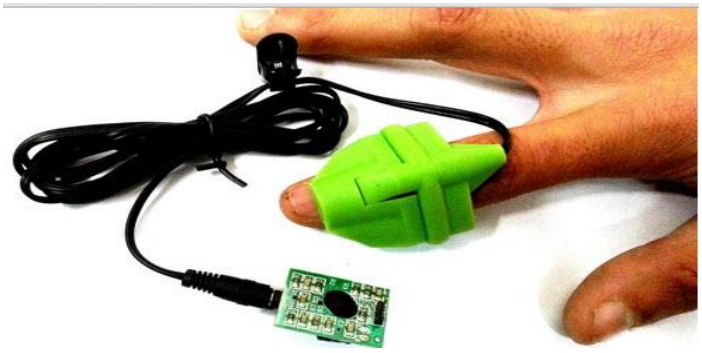

Fig.8.Heart-Bit Sensor

Above Fig.9. is shows the Heart-Bit Sensor. This sensor consists of a super bright red LED and light detector. The LED needs to be super bright as the maximum light must pass spread in finger and detected by detector. Now, when the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector. With each heart pulse the detector signal varies. This variation is converted to electrical pulse. This signal is amplified and triggered through an amplifier which outputs +5V logic level signal.

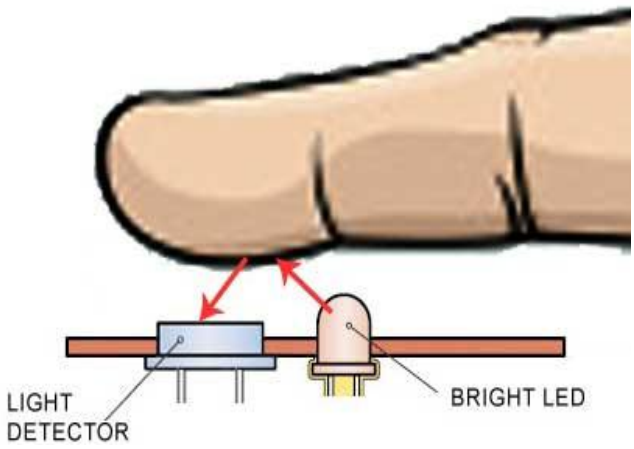


Fig.9.Heart-Bit Sensor

### G. OXYGEN SATURATION

Human life depends on the oxygen transport by haemoglobin. In healthy patients, the major ity of molecular oxygen (O2) is bound to haemoglobin and only a small fraction is dissolved in blood. But in patients with respiratory problems or certain metabolic and genetic disorders, the fraction of oxygenated haemoglobin can fall to dangerously low values. Therefore, labora tory assessment of oxygen saturation (SO2)—the percentage of haemoglobin saturated with oxygen—provides an important indicator of a

patient's cardio-respiratory status and is frequently used in the emergency department, during general and regional anesthesia, and in intensive care settings. Although the measured parameters are quite different for each, the three major analytical methods for mea suring oxygen saturation—arterial blood gas analyzers, pulse oximetry, and CO-oximetry—are frequently used interchangeably by health care workers. Arterial blood gas analyzers calculate estimated oxygen saturation (O2sat) in a blood sample based on empirical equations using pH and PO2 values, while pulse oximeters moni tor arterial blood oxygen saturation, commonly referred to as SpO2 or SaO2, noninvasively by passing selected wavelengths of light through an area of the body, such as a finger. Both are measures of oxygen saturation.

- It Depends on Heart Beat:-
  = 11/10 *No. of Heart Beat (Bit/m)

## G. RTC 1307

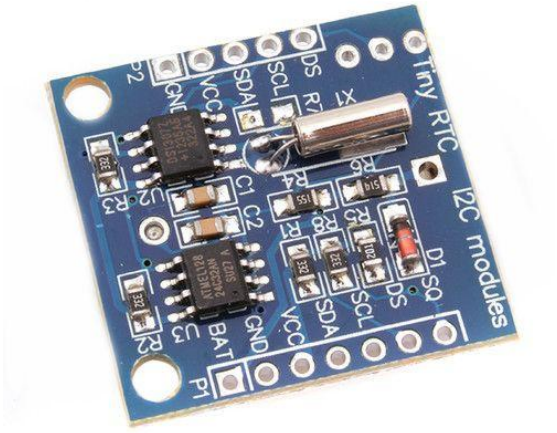


Fig.10.RTC

Above Fig.10. is shows the RTC 1307. This RTC DS1307 serial real-time clock (RTC) is a low-power, full binary-coded decimal (BCD) clock/calendar plus 56 bytes of NV SRAM. Address and data are transferred serially through an I2C, bidirectional bus. The clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The end of the month date is automatically adjusted for months with fewer than 31 days, including corrections for leap year. The clock operates in either the 24-hour or 12-hour format with AM/PM indicator. The DS1307 has a built-in power-sense circuit that detects power failures and automatically switches to the backup supply. Timekeeping operation continues while the part operates from the backup supply.

## H. MOTOR VIBRATOR

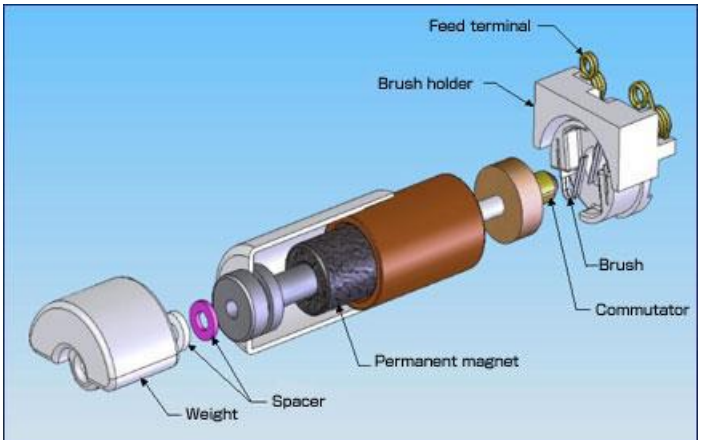


Fig.11.Motor Vibrator

Above Fig.11. is shows the Motor Vibrator. This Vibration motor is a compact size coreless DC motor used to informs the users of receiving the signal by vibrating, no sound. Vibration motors are widely used in a variety of applications including cell phones, handsets, pagers, and so on. The main features of vibration motor is the magnet coreless DC motor are permanent, which means it will always have its magnetic properties (unlike an electromagnet, which only behaves like a magnet when an electric current runs through it); another main feature is the size of the motor itself is small, and thus light weight. Moreover, the noise and the power consumption that the motor produce while using are low. Based on those features, the performance of the motor is highly reliable.

- **Mathematical Equation**

  **Force** $= f_{vibration} = \frac{MOTOR(RPM)}{60}$

  **Where**

$f_{vibration} = m \times r \times x^2$

**m = the mass of eccentric weight**
**r = mass' offset distance**
**w = speed of the motor (rads$^{-1}$)**

## V. RESULT ANALYSIS

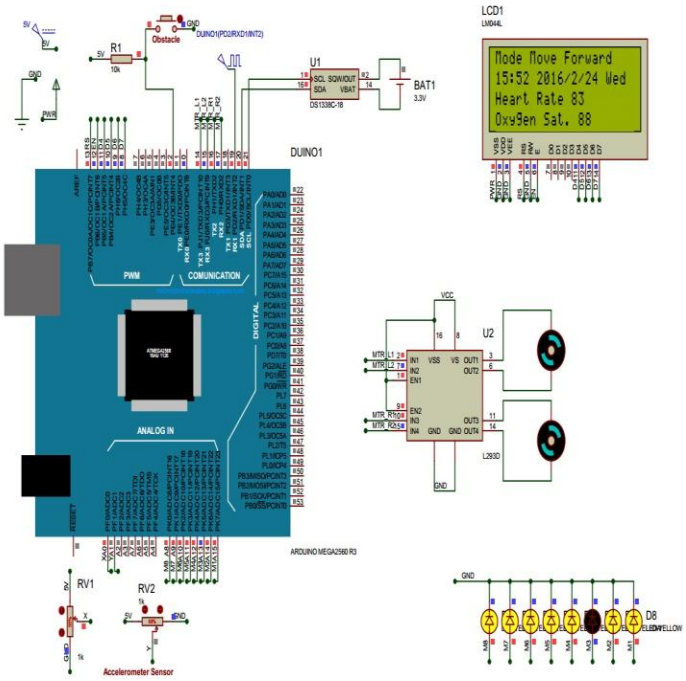


Fig.12. Circuit simulation

Fig.12. Circuit simulation gives the result of working of implemented design in Proteus V-7.7.

## VI. CONCLUSION

We have implementing automatic wheelchair which has various advantageous sophisticated facilities. It is operating in different modes i.e. accelerometer mode and it also indicate Heart-beat and Blood oxygen saturation count in display and voice mode. This Wheelchair will be economical and affordable to disable people for safe and self-sensor propel with patient automation.

## VII. BIBLOGRAPHY

We express our sincere gratitude to our Institute Sanjeevan engineering & technology institute, Panhala. We are thankful to the almighty for giving me the opportunity for carrying out this work under the guidance of Prof. S.N.Shinde. His encouragement and knowledge have helped us grow intellectually in a truly efficient manner.

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## BIOGRAPHY

Suraj N. Shinde received the B.E. degree in Electronics and Communication and M.Tech degree in VLSI Design and Embedded System from Visweswaraya Technological University, Belgaum, India. He joined as Assistant Professor in Kolhapur Institute of Technology's College of Engineering where he taught System on Chip, Real Time Systems and Satellite Communication subjects. Presently working in Sanjeevan Engineering and Technology Institute where he handled Advanced Microprocessors & Microcontrollers and Broadband Communication subjects. His research interest includes NoC, VLSI Signal Processing and MEMS packaging.

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