

# Recliner Freedom Wheelchair A Boon to the Special Ones

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**ABSTRACT:** Driving a guided or manual wheelchair or crutches is a tough mission and previously invented automated wheelchairs are not available in present marketplace that may be sold and used for bodily disabled persons according to their convenience, safety and comfort. The cause of this research paper is to propose a concept of an automated wheelchair device which will surpass the overall performance of all primary wheelchairs and give excellent results to the users keeping their comfort and safety in mind. The proposed wheelchair has been applied with layout, simulation and production of the complete body. Extensive testing was performed to make sure that the layout has best integrity. This wheelchair has the capacity to supply extended freedom to a good-sized person. We have also included the use of speech synthesizers in order to work through giving person enter voice commands and also work as an immediate medium to stop the wheelchair from moving any further in case of emergency.

**KEYWORDS:** Automatic Wheelchair, Sprocket Gear, Arduino, Structural Analysis, Cost-Effective Electro-Mechanical

## I. INTRODUCTION

In this paper i.e. Recliner Freedom Wheelchair, the goal is to make a version that would conceptually show that a powerful automated wheelchair may be designed that surpassed the overall performance of primary wheelchairs. These expectancies encompass correct designs and choice of mechanism, mechanical and electrical components mixed to create a version that would supply a befitting technique to the issues diagnosed.

The RECLINER freedom wheelchair concept efficaciously lets in a person to transport without propelling the wheel through their arm. The power assist motor absolutely replaces the characteristic of the affected arm. In evaluation with the present dual-rim and lever-arm wheelchairs, the prototype

without a doubt excels in maneuverability and no extra arm power required and the price evaluation additionally represents that it's far going to be the most inexpensive wheelchair version. These ambitions may be in addition described via numerous wonderful criteria:-

- a) Cost Effectiveness: This wheelchair will advantage the most people if the price isn't prohibitive. This issue is currently managed through the use of domestically to be had cloth andera.
- b) It should use sensible additives: Components must consider overall device weight and dimensions. They must be looking for to maximize on-board battery existence via strength performance and minimize preservation worries via simplicity and durability.
- c) It ensures clean and snug driving.
- d) It allows getting to know to address the chair and acquiring maximum performance.
- e) It must make the digital device open to destiny additions.
- f) It offers the last clean motion & convenient unbiased operation without help through handicapped.

Due to high sustainable stress, low price and availability, Mild metal has been selected over Aluminium, Cast iron, Stainless metal for body material. The built wheelchair has a body; 4 rear wheels with shafts units; the front caster wheels for clean turning and a sequence pushed tools teach for energy help to rear wheel from motor shaft. The Sprocket tools is joined with chain that is linked with any other smaller cassette this is mounted immediately on motor shaft. In this wheelchair the chain is used to transmit energy to pressure wheel from the dc gear motor. Whenever the motor shaft rotates then the sprocket of rear spindle begins off evolved rotating and therefore the wheel begins off evolved moving.

The very last output is a recliner freedom wheel

chair which offers a couple of choice to the person and attendee through supplying ease of defecation, cleansing and converting of clothes. Adjustable returned relaxation, arm relaxation, leg relaxation offers consolation for the affected person at the same time as resting. The adjustable arm relaxation offer ease of transferring the affected person from chair to the mattress or to the automobile. Facility furnished for maintaining plate at the same time as having meals, analyzing and maintaining water bottle. Further protection functions may be brought into the wheelchair like voice and gesture controller, speech synthesizer device also in case of emergency and for destiny scope of this paper, to recognize the exact region of the individual that is in wheelchair and through the use of GSM module an SMS may be dispatched to pre-described widevariety

### PRODUCT DESIGN

In this paper, the product layout is the idea of systematic method in know-how the person requirement, present deficits, possible development and inventing new designs via concept generation, idea development, and idea cognizance thereby bringing more recent merchandise and answers for the higher great of existence.

#### Need for New Design in a Wheel Chair

At present sufferers are going through trouble majorly at the time of defecating. Patient's wishes to be lifted up and helped to dispose of the get dressed and make them defecate, that's discomforting to the sufferers in emergency condition. The layout of returned relaxation withinside the present wheel chair creates repetitive pressure damage if theaffected person is sitting for an extended time. The gift layout of brake wishes to be progressed for higher effect and software of brake in slope area. Arm relaxation creates obstruction at the same time as transferring the affected person from wheel chair to motors, no answer withinside the present layout to make ease of transferring of affected person to transportationautomobile.

- **Problems Identified withinside the Present WheelChair**

Gemba study indicates that the 2 important varieties of wheel chairs used in hospitals and homes are inflexible body wheel chair and foldable X body wheel chair with and without commode layout. Problems diagnosed are as indexedbelow:

1. Observation indicates that there may be no adjustable arm relaxation, knee relaxation and footrelaxation.
2. Observation indicates that there may be issue

in transferring the affected person from wheel chair to vehicle mobile rickshaw and different motors because of bad braking device furnished diagnosedtrouble.

3. Shortage of the peak of the returned relaxation, no adjustable and cushioned returned relaxation, no head relaxation withinside the presentlayout.
4. Observation indicates trouble in defecation transferring of affected person to thecommode in case of non-commode wheel chair, casting off and cleansing trouble in case of present commode wheel chair.
5. Observation indicates that trouble in accomplishing the desk and nonadjustable top of desk for ease of labor which will increase repetitive pressure accidents like wrist, returned, shoulder accidents.

### METHODOLOGY CONSTRUCTION

The prototypeof thiswheelchair has to be made domestically to be had cloth, such as; timber for seat, returned relaxation and wheel, moderate metallic for body, commercially to be had shaft & sprocket equipment became used.

- **Rearshaft**

Basically, shaft contains the overall load of an automobile body. Major alternate is carried out on this structural creation. Instead of the use of common shaft, changed axles generally known as shaft is used withinside the automated wheelchair's wheels which aren't related. Available wheel chair in present marketplace has were given 15.25 cm lengthy and 12 mm diameter's axle in every rear wheel. But this creation has were given 30 cm lengthy and 2.5 cm diameter's axle. For clean particular controlling mechanism, separate shafts have used. This shaft includes wheels, bearing, bush, sprocketequipment.

- **Gear and chainforce**

Based on a pinnacle pace of 5 kilometer in keeping with hour and wheelchair wheels with a 25 cm radius, the output pace of the force device needed to at the least same at 105 rpm. Chain force has one important benefit over a conventional equipment train. Only equipment wheels and a series are had to transmit rotary movement over a distance. With a conventional equipment train, many gears should be organized meshing with every different in order to transmitmovement.

- **Mechanism of automatedwheelchair**

Major alternate is carried out withinside the shape and mechanism for this paper. Two

changed Shaft can be used with sprocket. This Sprocket has to be joined with chain that's related with some other smaller cassette this is hooked up without delay on motor shaft. Whenever the motor shaft rotates then the sprocket of rear spindle begins off evolved rotating and for this reason the wheel begins off evolved shifting. In this wheelchair the chain is used to transmit strength to force wheel from the dc equipment motor. A wood tray is connected under the seat to mount the dc equipment motor and battery. Two dry molecular batteries are used for strength. The manipulate circuitry is positioned under the seat that's blanketed in a box. After finishing the relationship of the electro-mechanical equipment.

- **COMFORT AND SAFETY**

A Recliner could be brought for people with confined mobility as an end result of damage, illness, or incapacity who locate sitting in an upright function to be not possible or uncomfortable, and for folks that require a simpler manner to alternate function. A reclining wheelchair lets in numerous important elements of

it to be adjusted to house diverse positions and wishes, inclusive of the backrest and foot relaxation. Many of them have an excessive returned to stable the individual, hold them cushy, and assist their top body. It will include arm rests, a seat that can be adjusted to exceptional angles, and regularly adjustable and/or detachable foot rests. Also covered are handles for the caregiver to push with, large wheels with handles for the person to push with, and small castor wheels at the front.

Most importantly, it functions an adjustable backrest this is generally operated with a hand brake manipulate through the attendant or caregiver. The manipulate can tilt or recline the backrest to an extra cushy function, from ninety stages in a seated function to as much as one hundred eighty stages for mendacity down. We can in addition enhance wheelchairs through making it with low price and excessive accuracy. Further protection functions may be brought into the wheelchair like voice and gesture controller, speech synthesizer device device also in case of emergency.

### CONCEPT GENERATION

Sr.no	Description	Specification
1	Structure	Steel tubing, Plastics Cushioned seat, fush gun, hand rest with cardboard
2	Color	Light Blue, Black, White, Gray and colorful powder coated material as an optional as per customer request.
3	Armrest Footrest	Well cushioned for comfortable resting of hands and adjustable footrest.
4	Manufacturing Processes	Cutting, Bending, Welding, Injection molding, Pressing, Grinding, Filling and assembling of parts.
5	Ergonomics	Head rest, Footrest, Adjustable commode, comfortable seat width.
6	Safety	Seat belt, Brake unit for emergency stopping, free from sharp edges, alarm, emergency light.
7	Additional Features	Adjustable knee rest, facility to keep water bottles, cord board to keep food items and books etc. while using and having food.
8	Disposal	Plastics and metals are separated and disposed or reused.

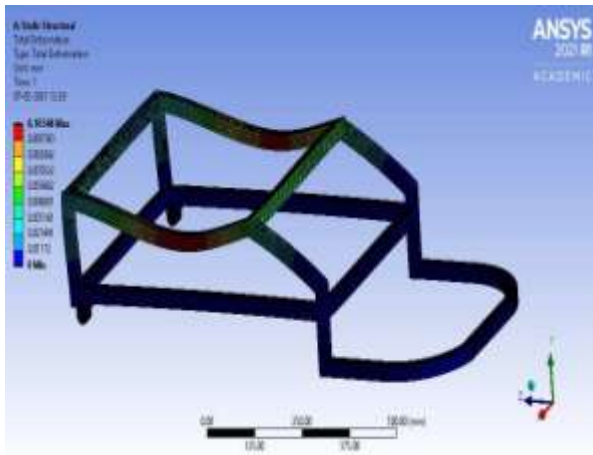
**Table 1. Product Design Specification**

Features	Description	Specification
Dimensional details	Dimensions in open stage	Length = 1685 mm Width = 750 mm Height = 834 mm
	Dimensions when flooded	Length = 1404 mm Width = 750 mm Height = 1000 mm
Ergonomics	Approximate net weight	180kg
	Maximum with stainable weight	100kg

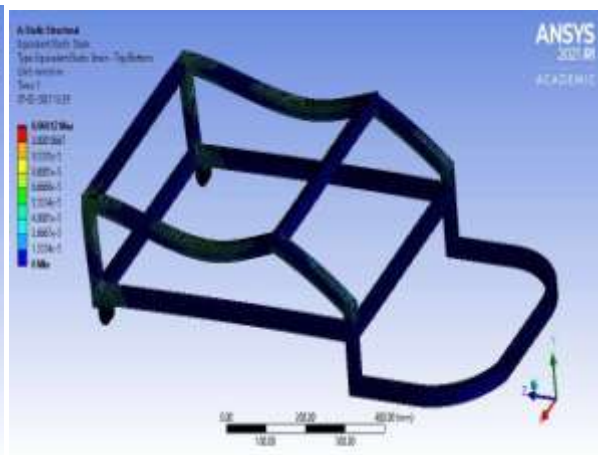
	(Max.)	
Material	Tube pipes, wheel rim, commode	Stainless steel / Mild steel
	Seat, Handle	Plastic, Leather
Wheel	Dimensions	Rear = dia. 668 mm Front = dia. 200 mm (total height 300mm) Front wheel (360-degree wheel)
Safety	Patient safety	Smooth surface and safety seat belt
Aesthetics	Body	Smooth curvature, No straight and Sharp edges
	Colors	White, Grey, Black major
Cost	Cost per Product	Approx. 18,000 to 20,000

**Table 2.** Quality Functional Deployment

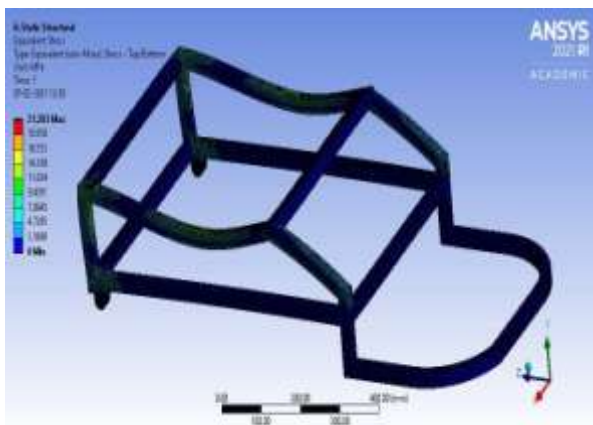
**STRUCTURAL ANALYSIS:  
FRAME**



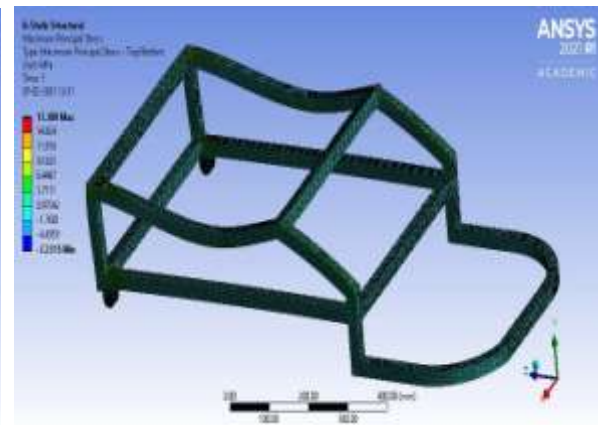
**TotalDeformation**



**Equivalent ElasticStrain**

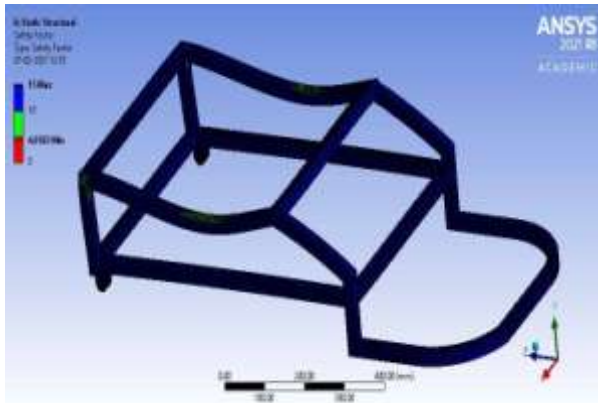


**EquivalentStress**

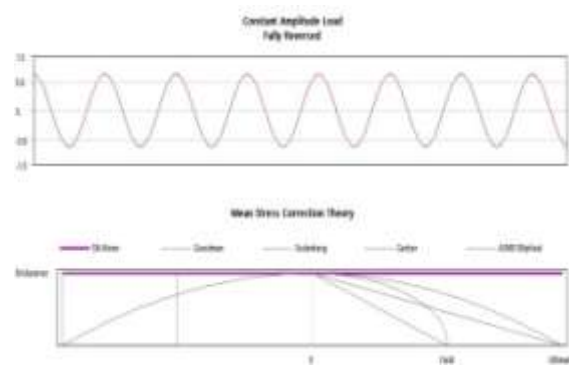


**Maximum PrincipalStress**





SafetyFactor



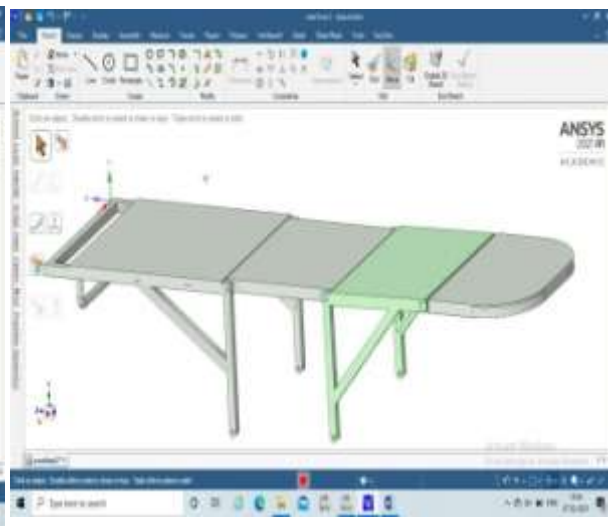
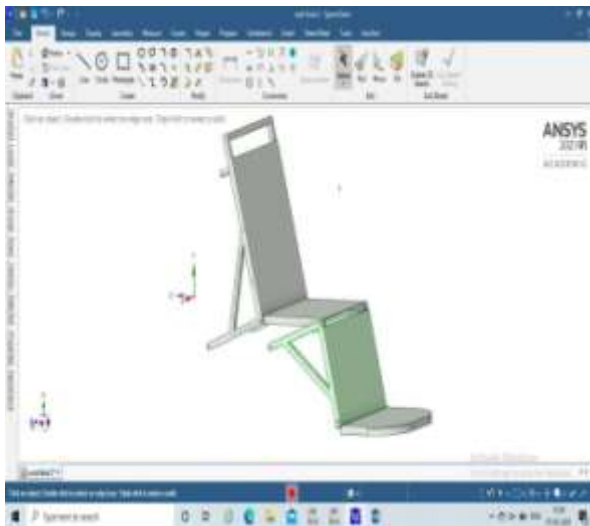
FatigueTool

**RESULT SUMMERY**

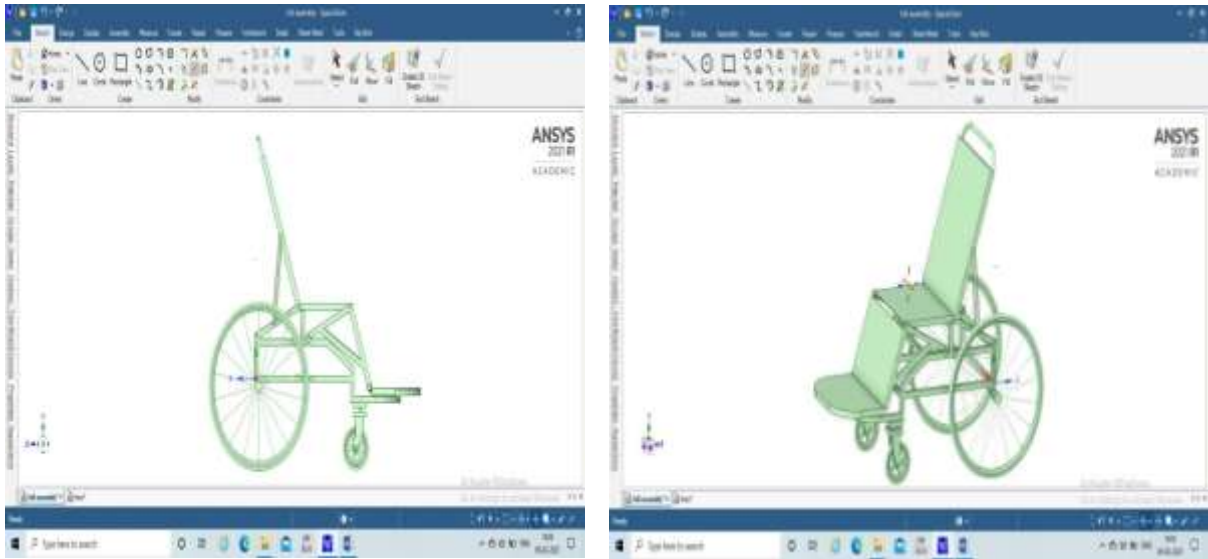
Results	Minimum	Maximum	Units	Time (s)
Total Deformation	0.	0.10548	mm	1.
Equivalent Elastic Strain	0.	1.2e-004	mm/mm	1.
Equivalent Stress	0.	21.283	MPa	1.
Safety Factor	4.0502	15.	Units Unavailable	0.
Maximum Principal Stress	-7.2315	17.389	MPa	1.

SEATPOSITION1

SEAT POSITION2



**ASSEMBLY**



**MOTOR CALCULATION:**

The rpm of the motor (N) = 30 rpm, Diameter of main wheel = 0.668 m  
 Now, speed of motor =  $3.141 \cdot D \cdot N$  (m/min)

Torque = force \* r (radius of main wheel = 0.334m)  
 =  $94.43 \cdot 0.334$   
 Torque = 31.54 Nm (On the axis)

Angular speed =  $(2 \cdot 3.141 \cdot N) / 60$

=  $3.141 \cdot 0.668 \cdot 30$  (m/min)

\*30/60  
 =  $(2 \cdot 3.141)$

= 62.9575/60

speed of motor = 1.049 (m/sec)  
 Angular speed = 3.141 rad/sec

Motor Power = Torque × Angular speed

(If we assume that wheel chair takes 2 seconds for accelerating from 0 to 1.398 m/sec, then) Acceleration (a)  
 =  $V/t$   
 =  $1.398 / 2$   
 Acceleration (a) = 0.524 m/sec

Now, the total weight of the frame wheel chair (70 kg), person (80- 90 kg), battery (10 kg) and motor (3-4 kg)  
 (M) = 180 kg (Maximum weight condition)

Required force =  $M \cdot a$   
 =  $180 \cdot 0.524$   
 Required force = 94.43 Newton

Now, to get a force of 66 Newton on outer diameter of wheel we required Torque,

$$= 31.54 \times 3.141$$

$$\text{MotorPower} = 99.06 \text{ Watt}$$

Taking into condensation fraction etc., 120-140 watt I think is suitable.

#### SELECTED MOTOR SPECIFICATIONS

- Type = D.C. geared motor
- RequiredPowerSupply = 12 Volt and 2 amperes current
- Speed = 30 RPM
- Average torque = 31.54 Nm
- Average power = 120-140 Watt

#### EXPERIMENTATION

##### Block Diagram Description

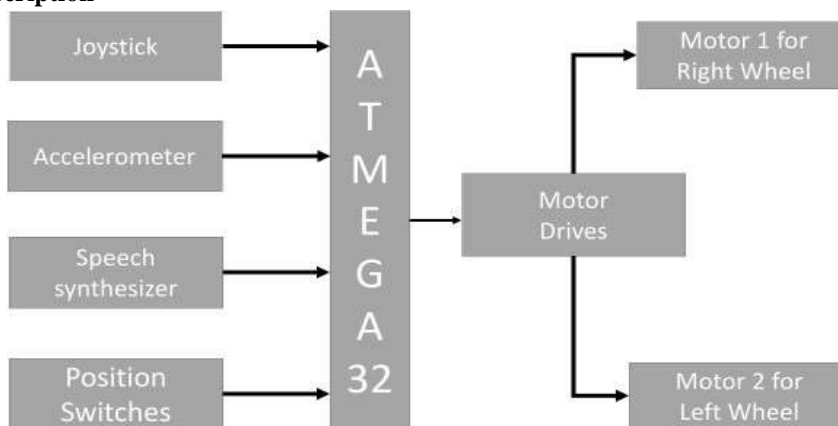


Fig. Block Diagram

- Accelerometer  
Accelerometer is one of the important inputs for this undertaking. The accelerometer sensors are established on headphone and that they transducer alternate in acceleration of head motion to voltage sign that is dispatched to ADC enter of microcontroller.
- Joystick  
Joystick is one of the important inputs for this project. The outputs of the 2-variable resistor of the joystick are related with the 2 channels of ADC.
- SpeechSynthesizer  
Speech synthesizer is one of the important inputs for this project. Speech synthesizer module works through giving person enter voice command.
- PositionSwitches  
These switches are connected at chair, to exchange the enter manage unit as Speech or Joystick or Accelerometer.
- Microcontroller

It is the primary computational and processing a part of the Smart Wheel Chair that takes enter from the sensor, procedures it and offers output. It operates at excessive frequency of 12 MHz and acts as manage middle for the robot.

- RelaySwitch  
A relay is an electrically operated switch. Many relays use an electromagnet to function a switching mechanism mechanically. It is used to exchange on or off electric circuits running at excessive voltage the use of a low DC manage voltage. Relays are used to offer excessive voltage to motors. The switching of relays is carried out the use of L293D motordriver.
- MotorDrivers  
Motor Drivers amplifies the TTL output of the microcontroller such that it can force the respective actuators. L293D IC is used for the switching the relay driver. It is twin H-Bridge IC.

#### Working Principle

- InputSensing

In this paper, the enter sensor for the clever wheel chair is an Accelerometer, Joystick, spechsynthesizer.

- Accelerometer

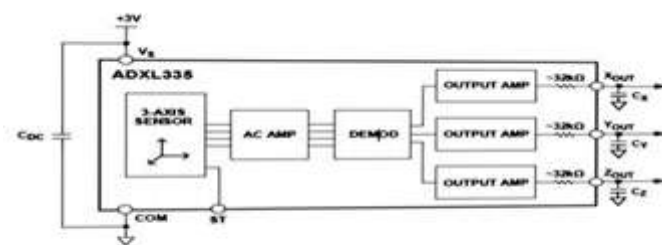


Figure 1: Block Diagram of ADXL335

The ADXL335 is a small, thin, low electricity, whole three-axis accelerometer with sign conditioned voltage outputs. The product measures acceleration with a minimal full-scale variety of  $\pm 3$  g. It can degree the static acceleration of gravity in tilt-sensing applications, in addition to dynamic acceleration attributable to motion, shock, or vibration. The person selects the bandwidth of the accelerometer the use of the CX, CY, and CZ capacitors on the XOUT, YOUT, and ZOUT pins. Bandwidths may be decided on to the software, with a variety of 0.5 Hz to 1600 Hz for the X and Y axes, and a variety of 0.5 Hz to 550 Hz for the Zaxis.

- Joystick

Analog joystick has variable resistors for 2 axes. Each variable resistor has 3 pins; excessive pins are related to Vcc (5v in our case) and ground. The middle pin is the output pin. The output voltage is among Vcc and GND relying on the location of stick. By measuring the voltage output of variable resistor from which the joystick is constructed, we are able to decide the location of stick in x and yaxis.

- SpeechSynthesizer

Speech Synthesizer module EasyVR is the second one era model of a success VRbot Module. It is a multi-reason speechreputation module designed to without problems upload versatile, strong and price powerful speech reputation abilities to truly any software. The EasyVR module may be used with any host with an UART interface powered at three.3V – 5V, consisting of PIC and Arduino boards.

**EasyVR functions:**

- Supports as much as 32 person-described Speaker Dependent (SD) triggers or instructions in addition to Voice Passwords. SD custom instructions may be spoken in ANY

language.

- Easy-to-use and easy Graphical User Interface to application Voice Commands and audio.
- Module may be used with any host with an UART interface (powered at 3.3V -5V)

**HARDWARE DESCRIPTION**

- three GPIO lines (IO1, IO2, IO3) that may be managed through new protocol instructions.
- PWM audio output that helps eight-ohmspeakers.
- Sound playbackfeature.

**Working precept of EasyVR:**

The voice command of person is ship to pattern and maintain circuit and its miles sampled through obeying Nyquist criterion. After that it's miles ship to ADC which convert the fee in virtual form. The voice command which we supply via module is stored to inner flash reminiscence and we application it via host microcontroller and it compares pre saved command and actual time command and carry out the specifiedassignment.



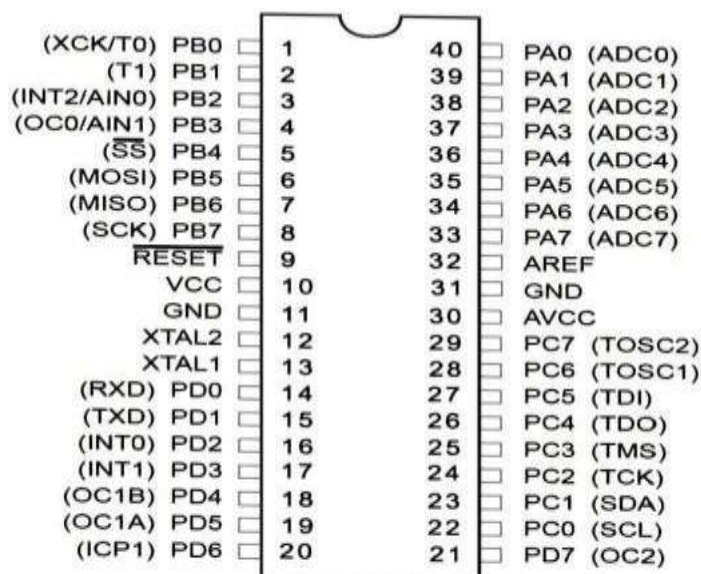


Figure 1.2 Pin Configuration of ATmega32

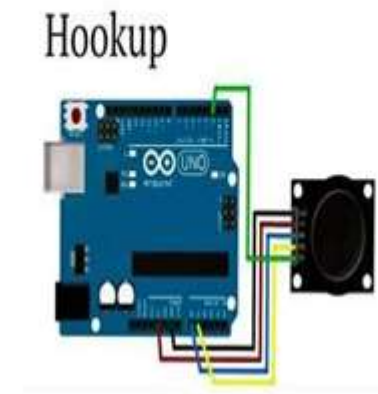
### HARDWARE DESCRIPTION

- Microcontroller (ATmega32) ATmega32 is a High-performance, Low-electricity Atmel eight-bit Microcontroller designed with Advanced RISC Architecture which has 131 Powerful Instructions amongst which maximum are single-clock Cycle Execution. Some functions of this microcontroller are as follows.
  - 32 × eight General Purpose Working Registers
  - Up to sixteen MIPS Throughput at 16MHz
  - On-chip 2-cycle Multiplier
- Peripheral Features
  - Two eight-bit Timer/Counters with Separate Pre-scalers and Compare Modes
  - One sixteen-bit Timer/Counter with Separate Pre-scaler, Compare Mode, and Capture Mode
  - Real Time Counter with Separate Oscillator
  - Four PWM Channels
  - eight-channel, 10-bit ADC
  - Byte-orientated Two-wire Serial Interface
  - Programmable Serial USART
  - Master/Slave SPI Serial Interface
  - Programmable Watchdog Timer with Separate On-chip Oscillator

- On-chip Analog Comparator
- High Endurance Non-Unstable Memory segments
  - 32Kbytes of In-System Self-programmable Flash application reminiscence
  - 1024 Bytes EEPROM
  - 2Kbytes Internal SRAM
  - Write/Erase Cycles: 10,000 Flash/a hundred,000 EEPROM
  - Data retention: twenty years at 85°C/a hundred years at 25°C
- Special Microcontroller Features
  - Power-on Reset and Programmable Brown-out Detection
  - Internal Calibrated RC Oscillator
  - External and Internal Interrupt Sources
  - Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby and Extended Standby
- Operating Voltages
  - 2.7V - five.5V for ATmega32L
  - 4.5V - five.5V for ATmega32
- Power Consumption at 1MHz, 3V, 25°C
  - Active: 1.1mA
  - Idle Mode: 0.35mA
  - Power-down Mode: <1>

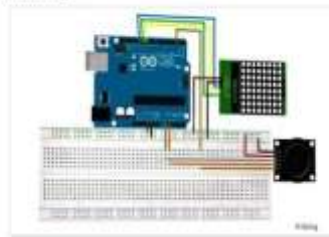
### Hookup Diagram :-

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output.

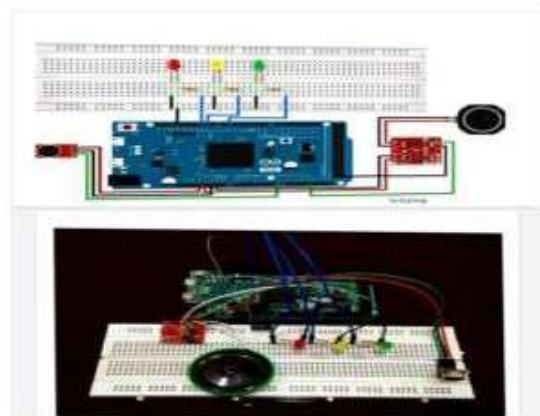


### JOYSTICK MAPPING DIAGRAM

This mapping of joystick positions to individual wheel speed can be done in an infinite number of combinations.



### SPEECH WIRING DIAGRAM



### SOFTWARE DESCRIPTION

In this paper, the software program controls the operation of the machine and

consequently it's miles vital that the software program is evolved in a faultless way with the intention to gain the favored result. In our

undertaking, all however one favored coding is saved withinside the microcontroller. It is the software program that controls the general functioning of themachine.

The saved application in a microcontroller controls all of the fundamental functionalities of the feature and the operation of the gadgets used withinside the machine. The inputs are taken from sensors and output of this system makes a decision motion to be taken through the machine. Software, being a critical a part of our undertaking, goes to be mentioned in element on thissection.

### SOFTWARE AND DEVELOPMENT PROCESS

It is crucial to undergo a chain of predictable steps to construct a product or a machine. Software technique allows to get a chain of steps. Software technique is computerized technique that simplifies project control and, what's maximum crucial, complements visibility of the undertaking. It offers stability to the project. Software technique calls for a scientific and constant technique to theproject.

In this paper, the software program or any application used for the operation of any machine may be written in any language thinking about numerous factors. The desire is made on the idea of following decisive factors. Required execution speed of peripheralgadgets

### CHOOSING C++ LANGUAGE

For the concept in this paper, C++ is an

effective, bendy language that gives rapid application execution and imposes few constraints at the programmer. It permits low stage get entry to to records and instructions at the same time as nevertheless maintaining the portability and syntax of an excessive stage language. These features make it a beneficial language for each machine programming and fashionable reason.

Its flexibility comes from the many approaches the programmer has to perform the equal tasks. C++ consists of bitwise operators together with effective pointer manipulation abilities. C++ imposes few constraints at the programmer. The important location this suggests up is in C's loss of type checking. This may be a effective gain to an skilled programmer however a risky downside to a novice.

Another sturdy factor of C++ is its use of modularity. Section of code may be saved in libraries for re-use in destiny programs. This idea of modularity additionally allows with 'c++' portability and execution speed. The middle C++ language leaves out many functions blanketed withinside the middle of different languages. These features are as a substitute saved withinside the C++ popular Library wherein they may be referred to as on whilst needed. An instance of this idea could be C's loss of constructed in I/O abilities. I/O features generally tend to sluggish down application execution and additionally be machine unbiased whilst jogging optimally. For those reasons, they're saved in a library one at a time fromthe C language and best blanketed whilstnecessary.

### COST ESTIMATION TABLE

Sr.no	Component	Quantity	Price (Rs.)
1	ATMEGA32	1	400
2	Speech Synthesizing Module	1	3500
3	Battery 12V, 22Ah	1	1000
4	Joystick	1	300
5	Motor Driver	2	350

6	Accelerometer (ADXL335)	2	1100
7	Resistors	50	100
8	Capacitors	5	100
9	Relay	5	200
10	Breadboard	3	65
11	5mm LED (Red)	2	50
12	Jumper wires (generic)	1	100
13	Arduino Board	1	1600
14	Mechanical Components		10,000
	<b>Total</b>		<b>19,514</b>

## II. RESULT AND DISCUSSION

The expectation of this project changed into that we would conceptually show that an powerful automatic wheelchair will be designed

that passed the overall performance of different wheelchairs. These expectancies have been a ways passed because the finalized concept achieved exceedingly well in all components of

### MECHANICAL COMPONENTS TABLE

Sr. No	Item	Qty	Specification	Material
1	Round pipe	12m	3/4 inch	MS
2	Square pipe	18m	3/4 inch	MS
3	Flat sheet	14sqft	16 gauge	GI
4	Nut and Bolt	12	8 mm	MS
5	Front wheel	2	20mm dia., 360-degree rotation	SS
6	Rear wheel	2	800 mm dia.	SS
7	Hinged arms	4		

8	Hinged pins	4		
9	Balancing springs	2		
10	Lead Screw with nut	1		
12	Lead screw handle	1		
13	Steel rod	3		

the layout specifications. Careful layout and choice of mechanism, mechanical and electric components mixed to create a project that would meet other wheelchair testing. Testing may be performed at the finalized layout to make sure the layout integrity. Integrity will be decided through how well the wheelchair met the layout specifications.

Structural analysis has been achieved to make sure that the wheelchair will be proficiently operated in accredited environments. Dynamic stability testing can be achieved to make sure that the wheelchair could travel properly on flat ground. Wheelchair users may want to successfully move the wheelchair while required electricity implemented to the motor. The distance among the rear wheels changed into expanded for the reason that each motor-facet wheel is positioned 15 cm further away from the wheelchair frame. This amendment is slightly extensive than current wheelchair however it didn't create any problem.

This Recliner freedom wheelchair correctly lets in a consumer to transport without propelling the wheel through their arm. The power-assisted motor absolutely replaces the feature of the affected arm. In evaluation with the current dual-rim and lever-arm wheelchairs, this layout definitely excels in maneuverability and no extra arm energy required. the speech synthesizer unit and the usage of joystick makes it even extra snug and secure to be used and the cost evaluation additionally represents that it is going to be one of the most inexpensive wheelchair versions for its kind.

### III. ACKNOWLEDGEMENT

The authors are grateful to the Department of Mechanical Engineering, Mahatma Gandhi Mission's College Of Engineering and Technology,

Navi Mumbai, and Mumbai University for their guidance and support.

### IV. CONCLUSION

The understanding received from product layout schooling is used to examine the prevailing wheel chair product via detailed Market research, GEMBA study, product study, problem identification, idea generation, idea finalization, detailing, and ridicule up modeling of the finalized idea. A strength-help computerized wheelchair prototype that effectively meets the numerous transportation desires of people with hemiplegia or bodily disabilities has been designed, manufactured, and tested.

Intricate layout element and execution led to a visually simplistic layout that promotes low fee and occasional maintenance. The modular component of the additives permits the machine to be retrofit to maximum guide wheelchairs with handiest minimum modifications. The fundamental intention of changing strength misplaced through a person affected arm while preserving maneuverability and transportability changed into successfully achieved. The basic dimensions of the built wheelchair and consequently keeps its cap potential to be transported withinside the trunk or backseat of a full-sized car. The minimization of fee is pretty cheap for maximum of the humans of Bangladesh and it could be even less expensive while taken for mass production. This assignment also can be counted as a top-notch initiative for the betterment of physically handicapped and disabled human's lifestyle.

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