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INTRODUCTION

Historical Background of the Wheelchair

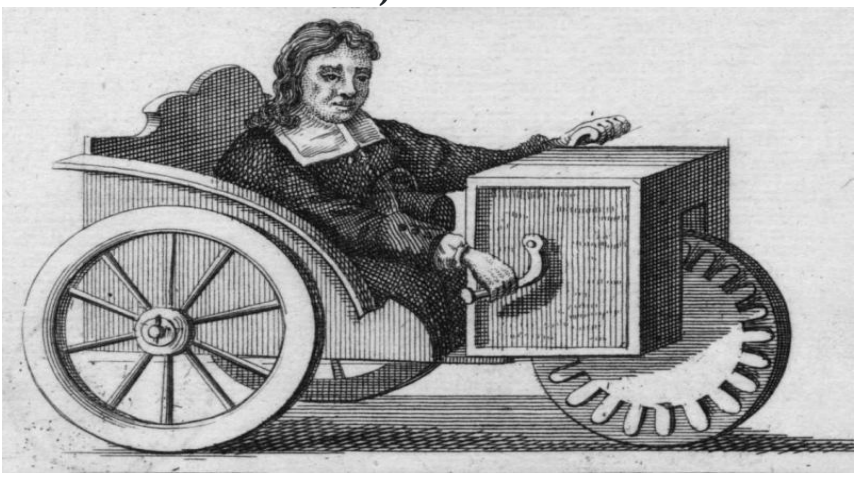
Wheel chairs contain evolved very little over the past thousand years. Most of the hardware design changes have implemented within recent decades as shown in the below presented outline of wheelchair history in the world. From 6th Century A.D., Earliest recording of a wheelchair; a Chinese engraved picturing a man in a such kind of chair with 3 wheels, In 16th Century A.D., Wheelchairs were well-developed in Europe and nearby countries and commonly found in drawings, posters and literature of the ancient people. In the time of American Civil War, the 1st look of wheelchairs in the USA. The chairs were of too heavy weight, big and bulky wooden construction with two big drive wheels and two small caster wheels. However, in 1869 .The first wheelchair model was issued in the United States. and in 1903, An EWC(electric wheelchair) operating on a 12-volt lead battery and a 3/8 hp (horsepower) motor was used to give handicapped people rides. At that time it was not used for handicapped mobility or physically disable person but it did pave the way for prospect developments.

however in 1909, Compact wheelchairs were developed using metal tubing instead of the traditional bulky wood components. World War I – The first electric wheelchairs were used for the physically paralysed people. A battery and motor were applied to existing wheelchairs with a simple one-speed on/off switch.

1937 – The patent for a wheelchair with a folding X-brace frame was issued to two engineers named Everest and Jennings. Though previous chairs had been foldable top-to-bottom, the side-to-side folding position of the cross frame allowed the drive wheels to remain in place. This basic concept is still the standard for manual wheelchairs today. while in 1940, The first patent was issued for an electric wheelchair abd also in 1950, researcher Sam Duke received a patent for a releasable add-on power drive applied to a manual wheelchair

1960's – Folding wheelchairs were commonly fitted with electric drives. The drive units were still very heavy and quite difficult to put on and take off. At that point both joystick and steering column mechanisms were available. In 1970's, Wheelchair frames made of aircraft quality aluminum were introduced to the market and started a revolution of ultralight wheelchairs. The technology has aided in the reduction of the overall weight of many types of wheelchairs. However , 1980's – Most electric wheelchairs on the market were still bulky, heavy, and required a special vehicle for transportation. The power components of the chair

were integrated into the frame which has been strengthened to support them. in 1990's – The popular electric wheelchairs on the market are foldable though they require removal of at least the leg rests and batteries. The Americans with Disabilities Act (ADA) and a growing awareness for the rights of the disabled have greatly improved research and design efforts in the assistive technology industry. Interest has also increased in this area due to the current trend toward the "graying of America" as the average age of Americans increases. (History of Wheelchairs and Power Add-On Units**)**



PROBLEM STATEMENT

Wheelchair framework is 1 of the normal vehicles utilized by physical mobility or wiped out ones are restricted in its capabilities, for e.g., it needs human power to move the chair. It is moreover can't be use for a important lot as the client drained in moving the seat utilizing their very own energy. On that point, the other problem is the presence wheel seat is additionally not so much affable as the shape and its position like as can't be fixing to the client's body in getting settled seat. This undertaking worried about the ergonomic feature which is the noteworthy component of human aspect building and thought of wheelchair formation are proposed after generally speaking the standards is fitting with this factor. In this responsibility, the need necessity is to assess the human factor building of the current wheel seat. Wheelchair configuration could be keeping the client from sitting in places that may detrimentally affect the spine. The ergonomic good-looking assembly of wheelchair which offers a fitting variable highlights and dissimilar components which can be changed by the client that need turn out with many plans and evaluate it as indicated by man factor designing and material determination. Before update it, expert need lead a market review to collect fundamental statistics to be integrate into the item.

LITERATURE REVIEW

A few investigations have demonstrated that the two kids and grown-ups advantage significantly from access to a methods for free portability, including power wheelchairs, manual wheelchairs, bikes, and walkers. Autonomous versatility increments professional and instructive chances, lessens reliance on parental figures and relatives, and advances sentiments of confidence. For little youngsters, free versatility fills in as the establishment for much early learning [1]. Non mobile youngsters need access to the abundance of upgrades managed self-ambulating kids. This absence of investigation and control regularly creates a cycle of hardship and decreased inspiration that prompts learned defenselessness. For grown-ups, free versatility is an important aspect of confidence and assumes a urgent job in "maturing in place." On the off chance that they become unable to walk or wheel themselves to the chest and help is not routinely accessible in the home when required, a move to an all the more empowering condition (e.g., helped living) perhaps fundamental. In addition, impaired portability frequently brings about diminished opportunities to mingle, which prompts social detachment, uneasiness, and depression. For instance, 31 percent of people with major mobility troubles detailed being much of the time discouraged or anxious, contrasted and just 4 percent of people without mobility challenges. (simpson, 2005)

A wheelchair is a wheeled portability gadget wherein the client sits. The gadget is impelled either physically (by turning the wheels by the hand) or by means of different computerized frameworks, Wheelchairs are utilized by individuals for whom strolling is troublesome or incomprehensible because of disease (physiological or physical), damage, or inability, Users can discover uniquely crafted high caliber ultra-light elite wheelchairs just as adornments that empower them to individualize their look and style. The principal wheelchair was concocted, required help to push, the twentieth century saw a quick advancement in wheelchairs, from the main mechanized wheelchair, to the principal collapsing wheelchair, to lightweight and sports wheelchairs. Inquires about in the territory of wheelchair control framework are as yet going on. Numerous individuals with incapacities don't have the aptitude fundamental to control a joystick on an electrical wheelchair. This can be an incredible downside for the client who is for all time unfit to move any of the arms or legs. They can utilize their wheelchair simpler just utilizing voice directions. In the proposed plan, the primary thought of utilizing voice actuated innovation for controlling the movement of the wheelchair is to demonstrate that it very well may be a selective answer for seriously incapacitated. (developed wheelchair, 2016)

GENERAL OBJECTIVE

- To design and to fabricate an automatic wheel chair for all kind of physical disabilities.
- To define mechanical properties, control system and mechatronics properties of the automatic wheelchair.
- To integrate appropriate sensor and actuators ad use contemporary software on the automatic wheelchair.

INDIVIDUAL OBJECTIVE

- To develop the program of joystick and position switches to control the armrest gears.
- To design and fabricate the armrest controls of the developed prototype of automatic wheelchair.
- To analyze and determine the external and internal forces on the wheels, axial shear, moments and bending stress, modulus and strain and failure involve in the framing of the automatic wheelchair and also identify stress concentration areas.

APPLICATIONS AND SCOPE:

Automatic smart wheel chair has extensive range of scope and applications is as follows:

- Physically disable person physically challenged people can use it as per their purposes, as they require the wheelchair ideally.
- One disable people who is able to move his head can go for accelerometer ADXL335 section; one disable people who is able to use his hand can go with joystick, no matter he is able to move his right or left hand, we can shift the position of the of the joystick and the position switches on the armrest. Furthermore, in case one able to move his legs only, he can go with the footrest section.
- Old people in the old age homes or various NGO's, children and old age home people can also use this smart wheel chair as per their requirement.
- Patients suffering in hospital from firm paralysis can use accelerometer ASDXL335 function by moving of their head when wearing that particular accelerometer helmet as per requirement.

EXISTING SYSTEM

Issues with Existing System

1. Existing system is unable to adapt to the external conditions.
2. Accuracy of identification is less.
3. Complex classification techniques employed.
4. Time consuming.
5. Power wheelchairs have increased in popularity, there are still many disabled, injured.
6. Disabled people imposes significant economic and social cost.

PROPOSED SYSTEM

The proposed methodology was trying to develop under the following assumptions:

1. To use wheelchair automatically for moving forward, backward, Left & Right through head movements.
2. Our project Automatic wheelchair basically works on the principle of acceleration, acceleration sensor.
3. When person tilt his head in forward direction above 20degree angle chair will move in forward direction.
4. If person tilt his head in backward direction above 20degree angle chair will move in backward direction.
5. If person tilt his head in left direction above 20degree angle chair will move in left direction.
6. If person tilt his head in right direction above 20degree angle chair will move in right direction.
7. If person tilt his head at 45degree forward priority will be given to forward direction.

Components used in this project

1. Aurdinuo UNO
2. Motor Driver L293d
3. Ultrasonic Sensor
4. Bluetooth Module(HC-05)
5. TT gear motor (4)
6. 65MM Wheels for TT Motors
7. Switch
8. Jumper Wires
9. Servo motor

Steps for making Automated wheelchair

Step 1:
Firstly, we will need Motors. For making.the car. At a minimum, you can use 2 motors for the left and right sides,But in this Project, we are using 4 DC Gear motors. More specifically,Here we are using 300RPM 9v TT Gear Motor for making Arduino Bluetooth car l293d.

Step 2:
Now we have to solder wires for powering up the motors. I am using Red and Black wires for the connection. If you are making mobile control car using Arduino, Then I would suggest you do all the same wiring connections as shown in the picture.

Step 3:
For making bluetooth car with speed control we are using Arduino UNO. This board is the main Heart of the Project. Arduino UNO R3

Step 4:
For the bluetooth controlled car using Arduino project report we will need a motor driver to run the 4 motors. So, we are using L293D motor Driver.

Step 5:
The next part is the battery connection part. Here I am using 2S Li-ion Battery for running the car. the L293D supports 12V as well. So, if you want higher speed then you can also use 3s Li-ion Battery as well.

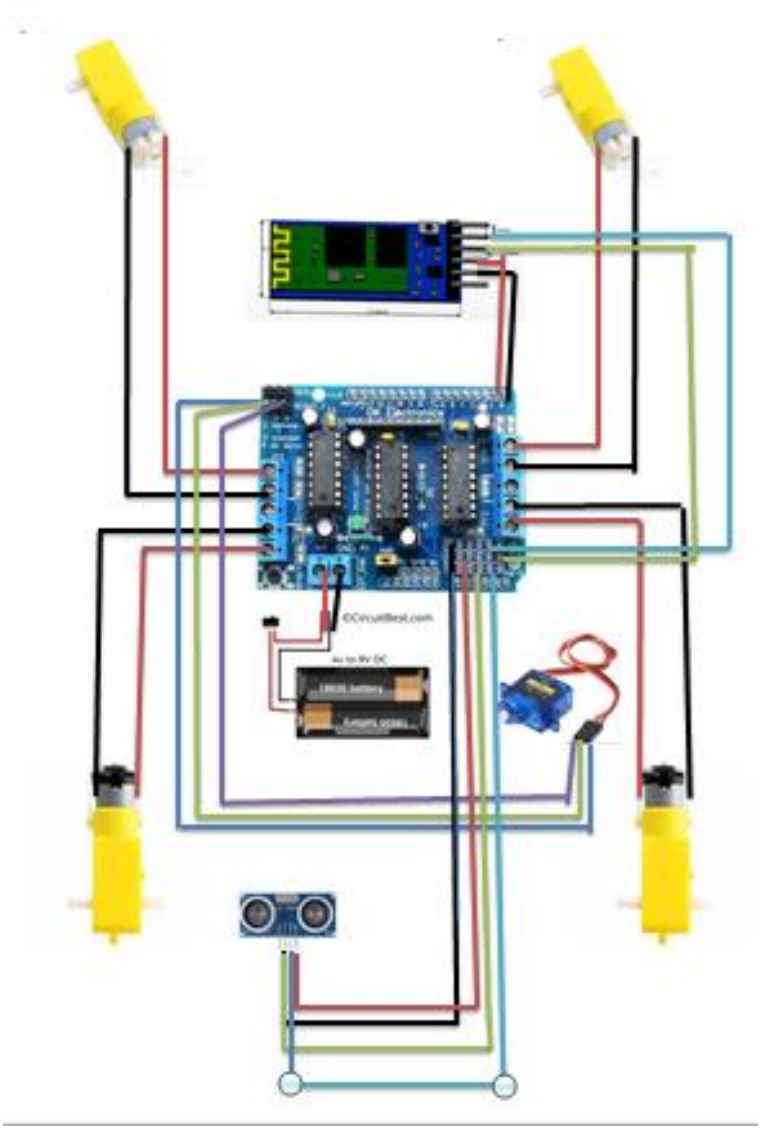
Here I have also added a switch for turning On/ Off the car. The connection of the switch is really simple. We have to connect the switch in series with the battery +ve. After that, the Switch Out (Battery +ve) and the Black Wire (Battery -ve) will be connected with the Motor Shield Power Input.

Step 6 :
The next step is we can use ultrasonic in this chair it can detect the things and move forward and backward and ultrasonic sensor isattached with servo motor that can detect obstacles.

Step 7:
Now to make an Arduino automated wheelchair control app we will need a wireless receiver. For the wireless signal transmission to the chair here we are using the HC-05 Bluetooth Module. This is a commonly used module for making different types of wireless signal transmission projects.

Step 8:
Now We have to upload the code to the Arduino UNO. So, we will connect the Arduino UNO's USB poet with the PC COM Port. First. Now If you are using Original Arduino that is labeled as "Made in Italy" then you will not need any modification. If you are using a Chinese clone with SMD Chip mounted on the Arduino then most likely you have to install the CH340 driver. Here we are using the Arafruit Motor shield library for running the Automated wheelchair. So you need to go to the following and then search for Adafruit Motor Shield Library.

Circuit Diagram of Automated Wheelchair



Arduino CODE

```
#include <Servo.h>
#include <AFMotor.h>

#define Echo A0
#define Trig A1
#define motor 10
#define Speed 170
#define spoint 103

char value;
int distance;
int Left;
int Right;
int L = 0;
int R = 0;
int L1 = 0;
int R1 = 0;

Servo servo;
AF_DCMotor M1(1);
AF_DCMotor M2(2);
AF_DCMotor M3(3);
AF_DCMotor M4(4);
void setup()
 {
  Serial.begin(9600);
  pinMode(Trig, OUTPUT);
  pinMode(Echo, INPUT);
  servo.attach(motor);
  M1.setSpeed(Speed);
  M2.setSpeed(Speed);
  M3.setSpeed(Speed);
  M4.setSpeed(Speed);
}
void loop()
 {
   Obstacle();
  //Bluetoothcontrol();
```

```
  //voicecontrol();
}
void Bluetoothcontrol()
{
  if (Serial.available() > 0)
{
    value = Serial.read();
    Serial.println(value);
  }
  if (value == 'F')
{
    forward();
  } else if (value == 'B')
{
    backward();
  } else if (value == 'L')
 {
    left();
  } else if (value == 'R')
{
    right();
  } else if (value == 'S')
 {
    Stop();
  }}
void Obstacle()
 {
  distance = ultrasonic();
  if (distance <= 12) {
    Stop();
    backward();
    delay(100);
    Stop();
    L = leftsee();
    servo.write(spoint);
    delay(800);
    R = rightsee();
    servo.write(spoint);
    if (L < R)
{
```

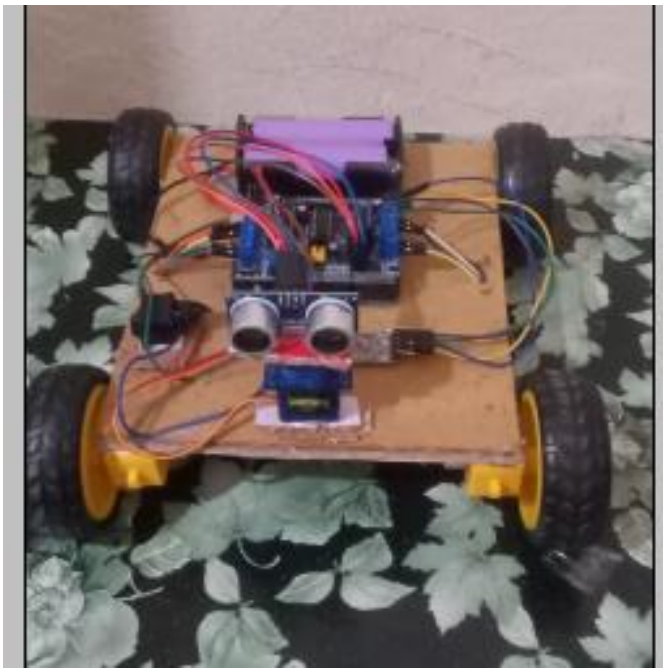
```
      right();
      delay(500);
      Stop();
      delay(200);
    }
else if (L > R)
 {
      left();
      delay(500);
      Stop();
      delay(200);
    } }
else
{
    forward();
  }}
void voicecontrol()
 {
  if (Serial.available() > 0)
{
    value = Serial.read();
    Serial.println(value);
    if (value == '^')
 {
      forward();
    } else if (value == '-')
{
      backward();
    } else if (value == '<')
{
      L = leftsee();
      servo.write(spoint);
      if (L >= 10 )
 {
        left();
        delay(500);
        Stop();
      }
else if (L < 10) {
        Stop();
```

```
      }
    }
else if (value == '>')
 {
     R = rightsee();
     servo.write(spoint);
     if (R >= 10 )
{
       right();
       delay(500);
       Stop();
     }
 else if (R < 10)
 {
       Stop();
     }
   } else if (value == '*')
 {
     Stop();
   } }}
int ultrasonic()
{
  digitalWrite(Trig, LOW);
  delayMicroseconds(4);
  digitalWrite(Trig, HIGH);
  delayMicroseconds(10);
  digitalWrite(Trig, LOW);
  long t = pulseIn(Echo, HIGH);
  long cm = t / 29 / 2; //time convert distance
  return cm;
}
void forward()
{
  M1.run(FORWARD);
  M2.run(FORWARD);
  M3.run(FORWARD);
  M4.run(FORWARD);
}
void backward()
{
```

```
  M1.run(BACKWARD);
  M2.run(BACKWARD);
  M3.run(BACKWARD);
  M4.run(BACKWARD);
}
void right()
{
  M1.run(BACKWARD);
  M2.run(BACKWARD);
  M3.run(FORWARD);
  M4.run(FORWARD);
}
void left()
{
  M1.run(FORWARD);
  M2.run(FORWARD);
  M3.run(BACKWARD);
  M4.run(BACKWARD);
}
void Stop()
{
  M1.run(RELEASE);
  M2.run(RELEASE);
  M3.run(RELEASE);
  M4.run(RELEASE);
}
int rightsee()
{
  servo.write(20);
  delay(800);
  Left = ultrasonic();
  return Left;
}

int leftsee()
 {
  servo.write(180);
  delay(800);
  Right = ultrasonic();
  return Right;}
```

Project Images



Limitations of Automated Wheelchair

1. May Have Limited Mobility In Some Situations
2. Wheelchair Weight Limits May Not Meet Your Needs
3. May Cause Injury To Your Spine
4. May Cause Skin Irritation And Pressure Ulcers In Some Users
5. Limited Availability And Variety Of Accessories And Options

Future Enhancement

- We can make a wheelchair which can be operated by a wireless remote. Output of sensor can be applied to wireless transmitter circuit and can received at wheelchair circuit by receiver circuitry. So wireless operation can reduce wiring arrangements.

- Instead of using acceleration motion (Head Movement) we can use eye retina using optical sensor to move wheelchair in different direction. Using retina movement we would be able to drive a wheelchair.

- We can use voice command IC to interface our voice signals with microcontroller. So computer interfacing may not be needed. The voice stored in IC could be sufficient to analyze speaker‟s voice Command.

- Researchers are going on development of handicap wheelchair using nervous system of human.

Conclusion

- This Wheelchair will be low-priced and can low-priced to frequent people. We can additionally add new technological know-how in this wheelchair. A machine for reliable awareness of speech and face has been designed and developed.
- This device can be made surprisingly efficient and wonderful if stringent environmental conditions are maintained. The setup for retaining these environmental stipulations will be a onetime investment for any actual existence application.
- The walking value of this machine is tons decrease as compare to different structures used for the same purpose. Always goal of the wheel chair is to transport a physically challenged man or woman from one location to another independently or via attendee.
- It has low value. If the designed chair is manufactured at mass level the manufacturing fee can also be reduced as noted earlier.
- It has safety belt for the security of the person. Further, the customers of electric powered wheelchairs make bigger their mobility, maneuverability and independence.
- On the different hand it desires attention now not only two to simply two fulfill the requirements of the two bodily challenged humans however it should be upgraded over a duration of time to furnish comfort, safety, multi-purpose, economical, light in weight for physically challenged person.
- In this paper a wirelessly controlled wheel chair is proposed with the assist of accelerometer, whose demo model is already designed for bodily handicapped human beings so that they can manage their chair themselves and the wireless Bluetooth application gives an more benefit if wheel chair is no longer with them then they can manipulate chair.

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