SMART WHEELCHAIR FOR ELDER AND DIFFERENTLY ABLED PEOPLE

A MINI-PROJECT REPORT

Submitted by

KARTHICK M	**710720205020**
SABARI KRISHNAN M	**710720205044**
TAMILARASAN S	**710720205058**

in partial fulfillment for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

INFORMATION TECHNOLOGY

Dr. N. G. P. INSTITUTE OF TECHNOLOGY, COIMBATORE - 641048

(AN AUTONOMOUS INSTITUTION)

ANNA UNIVERSITY:: CHENNAI 60002

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BONAFIDE CERTIFICATE

Certified that this project report **"SMART WHEELCHAIR FOR ELDER AND DIFFRENTLY ABLED PEOPLE"** is the Bonafide work of **KARTHICK M(710720205020),SABARIKRISHNAN M(710720205044),TAMILARASAN S (710720205058)"** who carried out the project work under my supervision.

SIGNATURE
Dr. M. KRISHNAMOORTHI M.E., Ph.D.,
HEAD OF THE DEPARTMENT
Department of Information Technology,
Dr. N. G. P Institute of Technology,
Kalapatti Road,
Coimbatore-641 048.

SIGNATURE
Ms.J.DHARANI M.E.,
Department of Information Technology,
Dr. N.G.P Institute of Technology,
Kalapatti Road,
Coimbatore-641 048.

Submitted for the End Semester Project Viva-Voce held on _____

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INTERNAL EXAMINER

_ _ _ _ _ _ _ _ _ _ _ _

EXTERNAL EXAMINER

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ABSTRACT

The development of a smart wheelchair specifically designed for elderly individuals and those with physical disabilities aims to enhance mobility, independence, and overall quality of life for this target population.The project focuses on integrating advanced technologies and intelligent features into a traditional wheelchair to provide users with a safer, more efficient, and user friendly mobility solution.The wheelchair can detect obstacles, plan optimal routes, and avoid collisions, ensuring safe and efficient movement in both indoor and outdoor environments.The wheelchair features an intuitive and user friendly interface,making it accessible to individuals with limited mobility or cognitive impairments. The interface provides easy control of wheelchair functions, navigation settings, and communication options.

KEYWORDS: Independent mobility,Accessibility,User friendly Interface.

LIST OF FIGURES:

LIST OF ABBREVIATIONS

DC	Direct Current
IDE	Integrated Development Environment
V	Volt^0

CHAPTER – 1

INTRODUCTION

This project aims to develop an automated wheelchair with real-time obstacle avoidance capabilities, making it easier for individuals with locomotive disabilities to move around independently. The wheelchair will be controlled using a smart phone application, eliminating the need for manual operation. The focus is to ensure that the wheelchair is affordable for a wide range of users, including both individuals and organizations that support people with disabilities. The project emphasizes the importance of safe and effective mobility for individuals with disabilities, providing them with innovative solutions to enhance their independence and self-use of wheelchairs. The proposed wheelchair will incorporate a android interface, enabling users to control its movements using speech recognition technology. The project consists of both software and hardware components. The software part involves developing an Android application to serve as the interface between the user's smart phone and the wheelchair. Bluetooth technology will be utilized to establish communication between the smart phone and the wheelchair, with Arduino serving as the controller for wheelchair movement based on the input received via Bluetooth. The wheelchair will be capable of seven fundamental movements, including moving forward, moving backward, turning right, turning left, stopping, leaning down, and sitting. These operations will be performed by the wheelchair in response to the commands received from the smart phone application. Overall, this project aims to improve the lives of disabled and elderly individuals by providing them with a motorized wheelchair that can be easily controlled using their smart phones. By incorporating obstacle avoidance capabilities and affordable design, this project intends to enhance mobility,independence, and overall well-being for its users.

1.1. OBJECTIVE

The project aims to achieve the following objectives:

To empower individuals with limited mobility by designing a Bluetooth-enabled smart wheelchair that allows seamless interaction and control through a user-friendly mobile application. This technology aims to enhance mobility,safety and independence by providing intuitive control, personalized settings, and real-time feedback to the user

1.2. SCOPE OF PROJECT:

The scope of the project is to develop a smart wheelchair that caters to the needs of elders and differently abled individuals.The wheelchair will incorporatebluetooth technology to enable seamless communication with external devices like smartphones, tablets. This Bluetooth connectivity will allow users to control the wheelchair remotely and provide input for various functions. A user-friendly mobile application or interface will be designed to facilitate easy control and customization of the wheelchair's movements

1.3. PROBLEM STATEMENT:

To address mobility challenges faced by the elderly and individuals with physical injuries or disabilities, an Android-based system will be developed to control a DC motor. This system aims to enhance independence and mobility for individuals who have difficulty walking or moving around. By utilizing an Android device, users will be able to control the wheelchair's movement, improving their quality of life.

1.4 FLOW DIAGRAM:

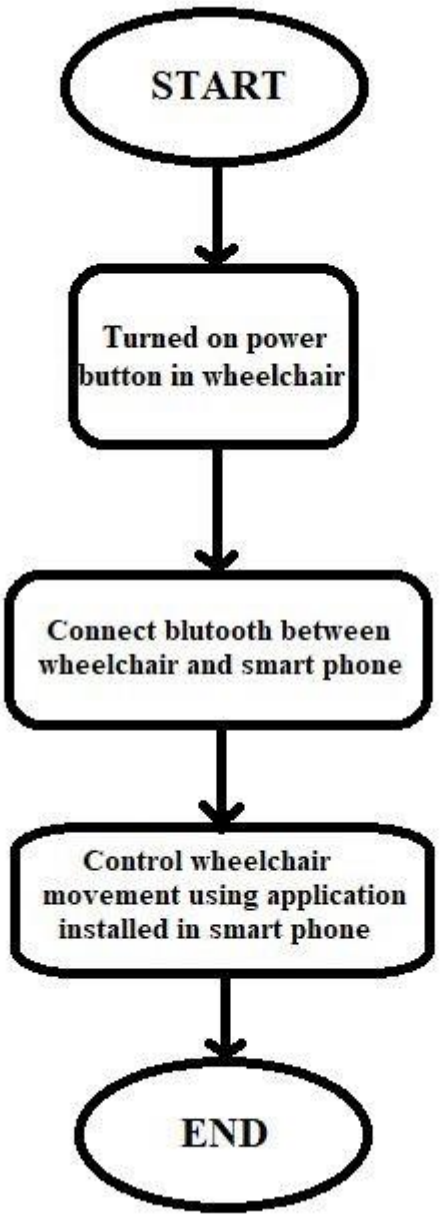

Fig. 1 FLOW DIAGRAM

1.5 BLOCK DIAGRAM AND FUNCTION

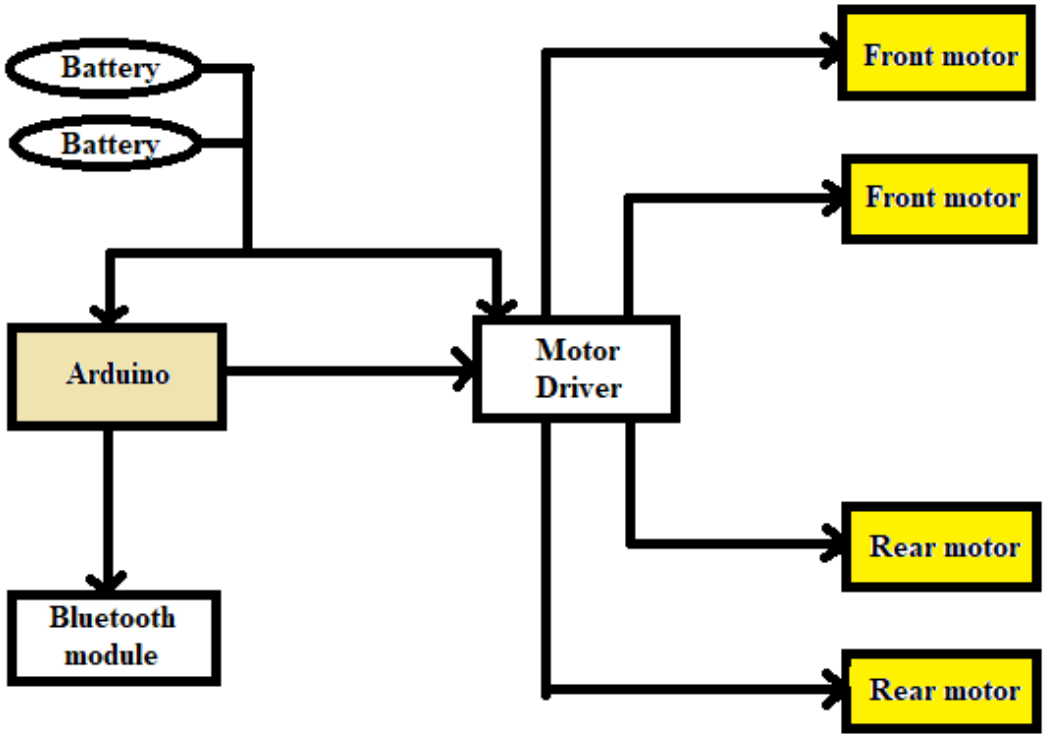

Fig. 2 BLOCK DIAGRAM

1.6 CIRCUIT ASSEMBLY

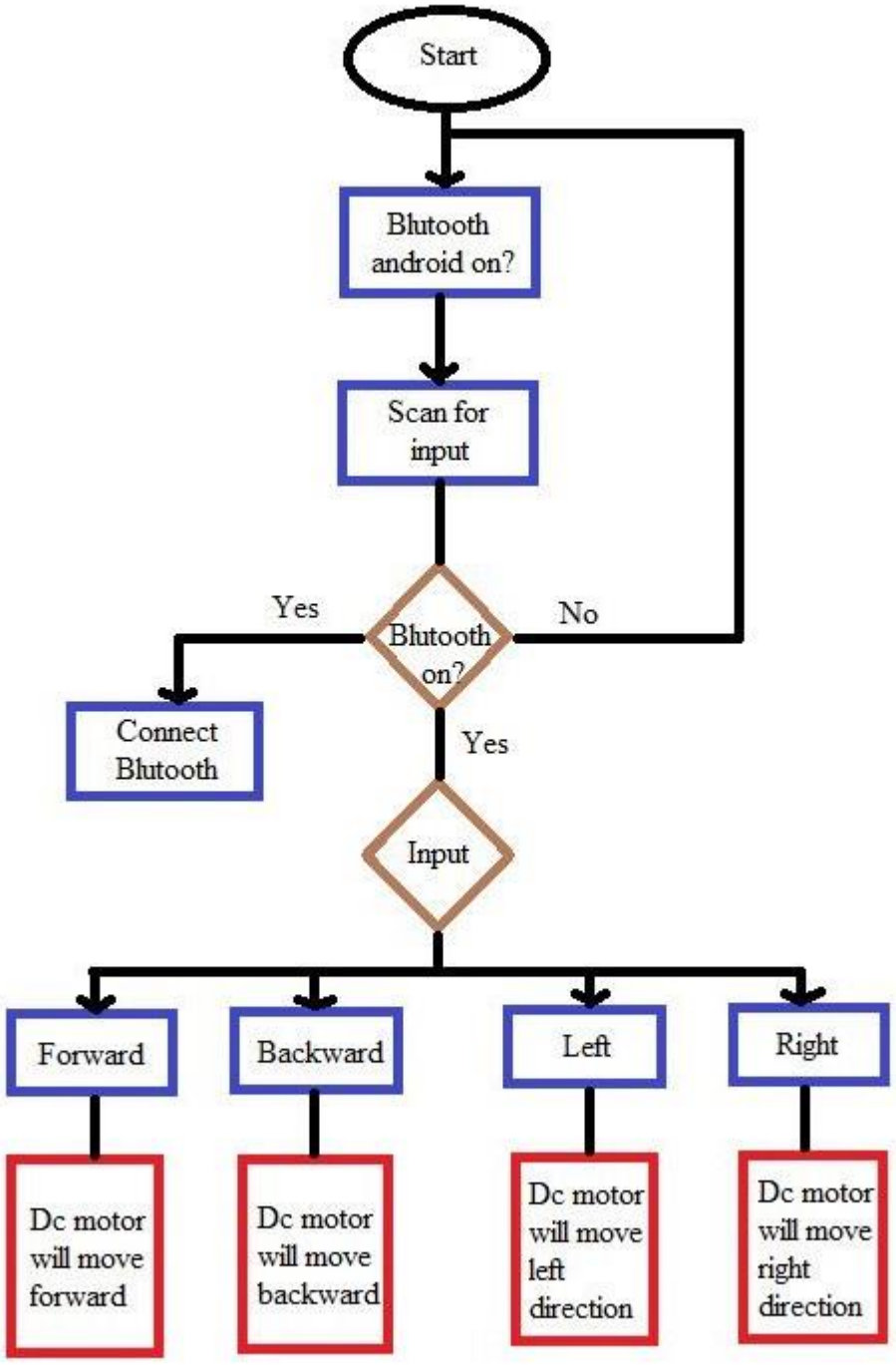

Fig. 3 CIRCUIT DIAGRAM

CHAPTER – 2

LITERATURE SURVEY

2.1. INTRODUCTION

In this chapter, we have researched from several magazines, journals, newspapers and some websites on things and projects that have been produced related to our project. Various studies have been conducted to produce a prototype of the wireless control wheelchair. The study was performed on the sensitivity of the controller, wheelchair's movement, method and issues.

2.2 LITERATURE REVIEW

1. Design and Implementation of a Smart Wheelchair System Based on Arduino and Android

Authors: X. Li, L. Liao, and Y. Peng

Published: 2017 IEEE International Conference on Mechatronics and Automation (ICMA)

2. Title: Development of a Smart Wheelchair System for Disabled People

Authors: T. Satoh, Y. Hosoda, and H. Kaneko

Published: 2014 IEEE International Symposium on Robotics and Manufacturing Automation (ROMA)

3. Design and Implementation of an Arduino-Based Smart Wheelchair System with Android Interface

Authors: A. Makarova and V. Zhgun

Published: 2016 IEEE International Conference on Engineering and Telecommunication (EnT)

4. Design of a Smart Wheelchair Control System Based on an Android Platform
Authors: L. Yan, L. Fan, and J. Liu
Published: 2017 IEEE International Conference on Computational Science and Engineering (CSE)

5. Development of a Smart Wheelchair System for Elderly People
Authors: N. Mohamed, H. Ali, and A. Abdelraheem
Published: 2016 IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT)

6. Arduino Based Smart Wheelchair with Eye Control
Authors: M. Siddique, A. Shahzad, and H. Javaid
Published: 2018 IEEE International Symposium on Robotics and Manufacturing Automation (ROMA)

7. Design of an Intelligent Wheelchair Using Arduino Microcontroller for Disabled People
Authors: M. K. H. Karim, M. A. R. Bhuiyan, and M. R. Amin
Published: 2015 IEEE International WIE Conference on Electrical and Computer Engineering (WIECON-ECE)

8. Implementation of a Smart Wheelchair for Disabled People Using Arduino and Android platform.
Authors: M. A. El-Nemr, M. H. Ahmed, and R. A. Abd-Alhameed
Published: 2014 IEEE International Symposium on Innovative Technologies in Engineering and Science (ITES)

9. A Smart Wheelchair Control System for Disabled People

Authors: J. Li, H. Li, and Z. Xu

Published: 2016 IEEE International Conference on Mechatronics and Automation (ICMA)

10. Arduino-Based Smart Wheelchair System for Disabled People with Speech Control

Authors: Z. A. Razak, S. G. Ponnalagu, and N. Mohd Nawi

Published: 2019 IEEE International Conference on Electrical, Electronic and Computer Engineering (ICEECE)

CHAPTER-3
EXISTING SYSTEM

3.1. EXISTING SYSTEM

3.1.1. EXISITNG SYSTEM

Smart wheelchairs with advanced features can be expensive, making them less accessible to individuals with limited financial resources.Some existing systems may have complex control interfaces, making it challenging for elderly or differently abled individuals to operate them independently. Simplifying the control mechanism and user interface can address this issue.Existing smart wheelchairs may not offer enough customization options to accommodate the specific needs and preferences of users. Creating a modular system that allows for personalization and adjustments based on individual requirements can be beneficial.Wheelchairs need to be robust enough to handle different terrains and daily usage. Ensuring the system's durability and reliability will be essential for user safety and satisfaction.

3.1.2. DRAWBACKS OF EXISTING SYSTEM

Some existing smart wheelchairs may have a limited range of control, restricting the user's mobility within a certain distance from the control device. This can limit the user's independence and freedom of movement.The initial setup process of connecting the wheelchair to a smart phone or other control device may be complicated and time-consuming. This can be challenging for users who are not familiar with technology or have limited technical skills.

CHAPTER-4

SYSTEM SPECIFICATION

4.1. HARDWARE SPECIFICATION

This section gives the details and specification of the hardware on which the system is expected to work.

i. Motor and Motor Controller.
ii. Arduino.
iii. Battery.
iv. Bluetooth Module.
v. Structural Components.

4.2. SOFTWARE SPECIFICATION

OPERATING SYSTEM:

The smart wheelchair may utilize an operating system for managing software applications, drivers, and system resources. Common choices include Linux-based operating systems or real-time operating systems (RTOS) that provide deterministic and responsive behavior.

4.2.1. TECHNOLOGY USED:

TECHNOLOGIES:

Bluetooth:

Technology will be utilized to establish wireless communication between the smart wheelchair and external devices such as smartphones,tablets.This enables users to control the wheelchair remotely and exchange data for various functionalities

Arduino:

An open source electronics platform, will be used for the development and integration of hardware component in wheelchair system.Arduino and capabilities to control and interface the electronic modules.

Mobile Application:

A user-friendly mobile application will be developed to facilitate control, and interaction with the smart wheelchair. The mobile app will communicate with the wheelchair via Bluetooth, enabling users to adjust settings, control movements, and access features through a familiar and intuitive interface.

TOOLS REQUIRED:

i. Arduino IDE
ii. Android Studio

4.2.2. TECHNOLOGY DESCRIPTION:

- **ARDUINO BOARD**

  Arduino Board is an microcontroller board based on the ATmega328P. It has 14 digital input/output pins(of which 6 can be used as PWM outputs), It is used to control all the component attached to the Arduino Board.

- **ARDUINO BLUETOOTH HC-05 MODULE**

  Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal are networks (PANs).

- **MOTOR DRIVER L298N**

  The L298N is an integrated monolithic circuit in a 15-lead Milliwatt and PowerS020 packages. It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic level sand drive inductive loads. An additional supply input is provided so that the logic works at a lower voltage.

- **DC MOTOR**

  A DC motor is any of class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanically or electronic, to periodically change the direction of current flow in part of the motor.

SOFTWARE DESCRIPTION:

- **ARDUINO IDE:**

  The Arduino IDE is a software tool used for programming Arduino boards. It provides a code editor, library management, and debugging features to develop and customize projects with Arduino microcontrollers.

- **ECLIPSE JEE:**

  Android Studio is an Integrated Development Environment (IDE) used for creating Android applications. It offers a code editor, visual layout editor, debugging tools, and emulator to streamline the development process.

CHAPTER-5
PROPOSED SYSTEMS:

5.1. PROPOSED SYSTEMS:

The proposal consists of introduction for the project, objectives, problem statement, scope, literature review and methodology, principle of operation, block diagram, schematic diagrams, circuit operation, cost and Gantt chart. When the proposal is approved the project can proceed the project installation where the real project is build. The copy of the approved proposal is attached on appendices sections**.**

5.2. PROPOSED METHOD:

The proposed system is a smart wheelchair control system that relies on Arduino and Bluetooth technology. It allows users to control the movement of the wheelchair using a smartphone. The system offers convenience and accessibility by leveraging the smartphone's user-friendly interface. The Arduino board receives commands from the smartphone via Bluetooth and translates them into motor control signals, enabling precise and responsive wheelchair movement. This solution enhances mobility and independence for individuals with limited physical abilities.

CHAPTER-6

DEPLOYMENT

6.1. DEPLOYMENT DETAILS

Deployment of a smart wheelchair involves the process of installing and configuring the system in the intended environment, ensuring its proper functioning and usability.

Installation: Physically install the smart wheelchair in the designated location. This includes assembling the wheelchair components, attaching sensors and actuators, and ensuring proper connections between hardware and software components.

Configuration and Calibration: Configure the smart wheelchair system according to the specific needs and preferences of the end-users. This involves setting up parameters such as motors for the specific weight.

CHAPTER-7

RESULT AND DISCUSSION

7.1. OUTPUT AND DISPLAY:

The module page is as like shown below

STEP 1:

Install wheelchair control application on your mobile named “Bluetooth RC ”.

Fig. 4 INSTALLATION PAGE

STEP 2:

Turn on power button on the right side of the wheel chair

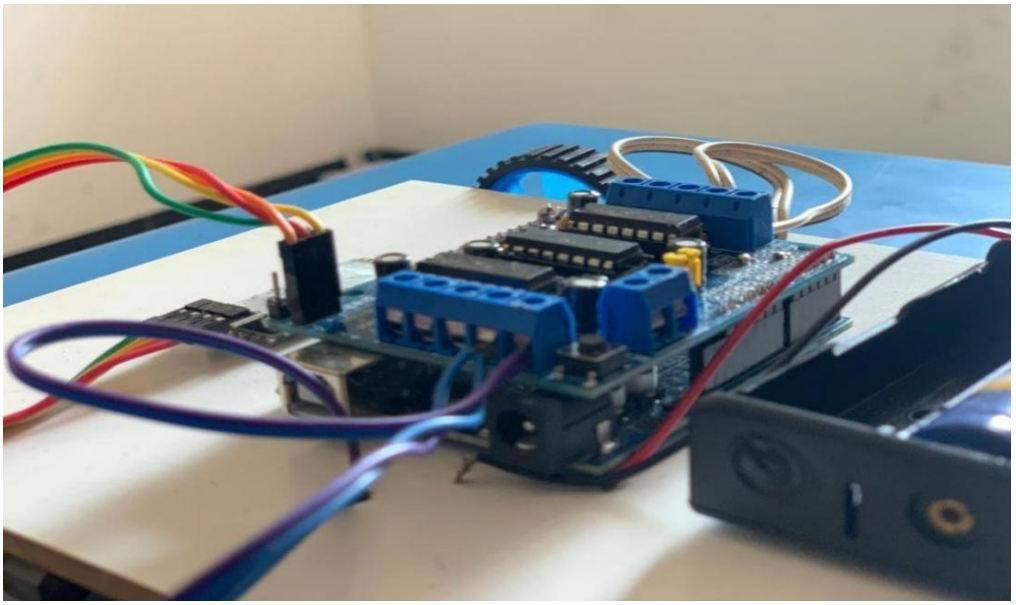

Fig. 5 POWER BUTTON

STEP 3:

Connect Bluetooth between smartphone and wheelchair on the application by using connecting car button.

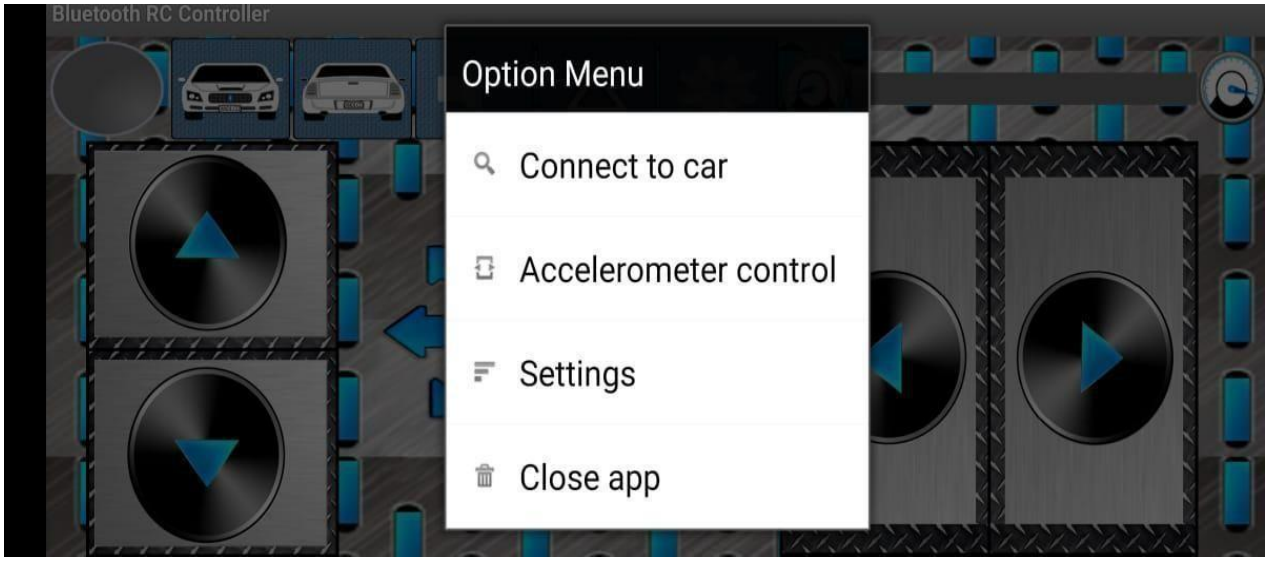

Fig. 6 BLUETOOTH INTERFACE

STEP 4:

When paring is success full you can start riding.

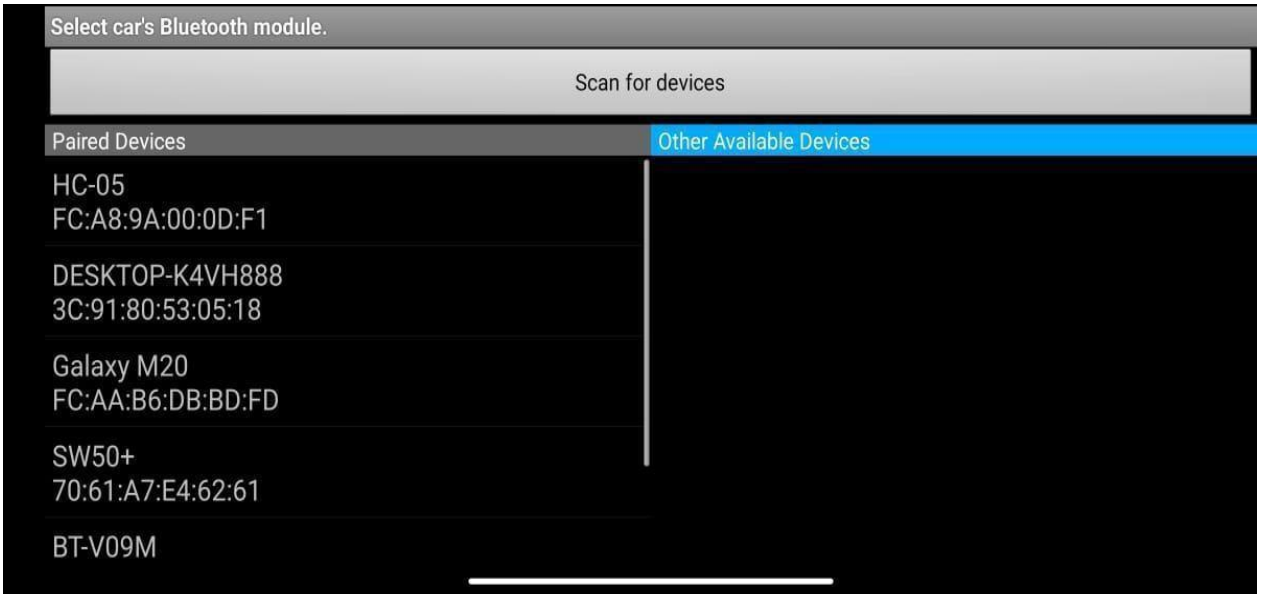

Fig. 7 BLUETOOTH CONNECTION PAGE

CHAPTER-8

CONCLUSION

8.1. CONCLUSION

i. In conclusion, the development and deployment of a smart wheelchair for elders and differently abled individuals involve a range of considerations and components. By leveraging technologies such as Bluetooth and Arduino, the smart wheelchair aims to enhance mobility, accessibility, and convenience for users. The project's objective is to provide a user-friendly, reliable, and secure solution that improves the quality of life for individuals with mobility challenges.

ii. Throughout the project, several aspects were addressed, including hardware specifications such as motor control units, sensor units, and Bluetooth modules. The software specifications encompassed user interfaces, control algorithms, communication units, and error handling mechanisms. The system underwent rigorous testing, including unit testing to verify the functionality of individual components, conditional testing to assess performance under various scenarios, and security testing to ensure robust protection against vulnerabilities and threats.

iii. By successfully deploying the smart wheelchair, users can benefit from its advanced features, such as user-friendly interfaces and secure Bluetooth communication. The system aims to provide a reliable and accessible mobility solution, promoting independence, comfort, and improved quality of life for elders and differently abled individuals.

iv. Overall, the smart wheelchair project demonstrates the integration of technology and innovation to address the unique needs and challenges faced by individuals with mobility limitations. Through careful development, testing, and deployment processes, the smart wheelchair strives to provide a practical, user-centric, and empowering solution for enhanced mobility and independence.

CHAPTER – 9

APPENDIX

9.READ ME FILE

9.1. ABOUT THE APPLICATION

This method is proposed with reliable and robust method for the effective usage of the wheelchair.

9.2. DEVELOPERS

KARTHICK M -muthukarthick952@gmail.com

SABARI KRISHNAN M - sabarikrihsnanit@gmail,com

TAMILARASAN S - tamilooo757@gmail.com

CHAPTER – 10

SOURCE CODE

10. SOURCE CODE

10.1 PROGRAM FOR WHEELCHAIR MOVEMENT.

```
#include
<AFMotor.h>
#include <SoftwareSerial.h>
SoftwareSerial bluetoothSerial(9, 10); // RX, TX
//initial motors pin
AF_DCMotor motor1(1, MOTOR12_1KHZ);
AF_DCMotor motor2(2, MOTOR12_1KHZ);
AF_DCMotor motor3(3, MOTOR34_1KHZ);
AF_DCMotor motor4(4, MOTOR34_1KHZ);
char command; void setup()
{
bluetoothSerial.begin(9600); //Set the baud rate to your
Bluetooth module.
} void loop() { if
(bluetoothSerial.available() > 0)
{command = bluetoothSerial.read();
Stop(); //initialize with motors stoped
switch (command)
{case
'F':
forward();22
break; case 'B':
back();
```

```
break;
case 'L':
left();
break;
case 'R':
right();
break;
}
}
}
Void forward()
{ motor1.setSpeed(255); //Define maximum velocity
motor1.run(FORWARD); //rotate the motor clockwise
motor2.setSpeed(255); //Define maximum velocity
motor2.run(FORWARD); //rotate the motor clockwise
motor3.setSpeed(255); //Define maximum velocity
motor3.run(FORWARD); //rotate the motor clockwise
motor4.setSpeed(255); //Define maximum velocity
motor4.run(FORWARD); //rotate the motor clockwise
}
Void back()
{
motor1.setSpeed(255);
//Define
maximum
velocity
motor1.run(BACKWARD); //rotate the motor anti-23
clockwise
motor2.setSpeed(255);
//Define
```

```
maximum velocity
motor2.run(BACKWARD); //rotate the motor anti-
clockwise
motor3.setSpeed(255);
//Define
maximum velocity
motor3.run(BACKWARD); //rotate the motor anti-
clockwise
motor4.setSpeed(255);
//Define
maximum velocity
motor4.run(BACKWARD); //rotate the motor anti-
clockwise
} void
left()
{ motor1.setSpeed(255); //Define
maximum
velocity
motor1.run(BACKWARD); //rotate the motor anti-
clockwise
motor2.setSpeed(255);
//Define
maximum velocity
motor2.run(BACKWARD); //rotate the motor anti-
clockwise motor3.setSpeed(255); //Define maximum
velocity motor3.run(FORWARD); //rotate the motor
clockwise motor4.setSpeed(255); //Define maximum
velocity motor4.run(FORWARD); //rotate the motor
clockwise
}
```

```
void right()
{
motor1.setSpeed(255); //Define maximum velocity
motor1.run(FORWARD); //rotate the motor clockwise
motor2.setSpeed(255); //Define maximum velocity24
motor2.run(FORWARD); //rotate the motor clockwise
motor3.setSpeed(255); //Define maximum velocity
motor3.run(BACKWARD); //rotate the motor anti- clockwise
motor4.setSpeed(255); //Define maximum velocity
motor4.run(BACKWARD); //rotate the motor anti-
clockwise }
void Stop()
{
motor1.setSpeed(0);
//Define
minimum
velocity
motor1.run(RELEASE); //stop the motor when release the
button motor2.setSpeed(0); //Define minimum
velocity motor2.run(RELEASE); //rotate the motor
clockwise motor3.setSpeed(0); //Define minimum
velocity
motor3.run(RELEASE); //stop the motor when release the
button motor4.setSpeed(0); //Define minimum
velocity
motor4.run(RELEASE); //stop the motor when release the
Button
 }
```

CHAPTER - 11

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Volume 2017; Article ID 100005, pp. 01-06; Feb. 2017.