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A Project Report on

Multi-Featured Carts/Trolly

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CERTIFICATE

It is hereby certified that the work which is being presented in the BTECH Project Report entitled **"Multi-Featured Carts/Trolly"**, in partial fulfillment of the requirements for the award of the Bachelor of Technology in Electronics & Telecommunication Engg.and submitted to the **School of Electronics & Telecommunication Engineering** of **MIT Academy of Engineering, Alandi(D), Pune, Affiliated to Savitribai Phule Pune University (SPPU), Pune**, is an authentic record of work carried out during Academic Year **2023–2024**, under the supervision of **Prof. Satish Kabra**, **School of Electronics & Telecommunication Engineering**

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DECLARATION

We the undersigned solemnly declare that the project report is based on our own work carried out during the course of our study under the supervision of **Prof. Satish Kabra**.

We assert the statements made and conclusions drawn are an outcome of our project work. We further certify that

1. The work contained in the report is original and has been done by us under the general supervision of our supervisor.
2. The work has not been submitted to any other Institution for any other degree/diploma/certificate in this Institute/University or any other Institute/University of India or abroad.
3. We have followed the guidelines provided by the Institute in writing the report.
4. Whenever we have used materials (data, theoretical analysis, and text) from other sources, we have given due credit to them in the text of the report and giving their details in the references.

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Abstract

As we all are known to the Trolleys/ cart that are used in Shopping stores . Now-a-days we need to move that cart manually. Also we need to visit billing counter after the completion of shopping for payment and to take bill. So, we are going to add some features to our cart so that it will reduced human efforts as well as it will help to save customer's time.

We are going to add following features:

It Will be voice controlled.

It will be self-obstacle detection.

Self-Billing.

Acknowledgment

We would like to express our sincere gratitude to Sr. Professor Dipti Y. Sakhare of the electronic and telecommunication department and Project Coordinator Dr. Gayatri Ambadkar of the MIT Academy of engineering College for their support in accomplishing our project titled Multi-Featured cart. We especially wish to acknowledge our mentor, Prof. Satish Kabra, for all of his cooperation over the duration of the semester. He gave us priceless counsel and supported us through trying times. His drive and assistance made a significant difference in the project's successful conclusion. We learned a lot of new stuff and it also aided in our extensive research. We are very appreciative to them. We will always be obliged to you for this. We would like to emphasize that we accomplished the first portion of the project fully on our own, without assistance from anyone else.

students

Contents

List of Figures

Chapter 1

Introduction

1.1 Background

The Multi-Featured Cart project aims to create a versatile and innovative cart system that incorporates voice control and self-obstacle detection capabilities. This project combines hardware and software components to develop a smart cart that can be used in various applications, such as shopping, warehouse management, or healthcare settings. Multi-Featured cart/Trolly assembles a voice-controlled that controlled by voice commands which responds in accordance with the corresponding voice control.The project of a Multi-featured Cart with voice control and Self-obstacle detection can find its niche in various industries and applications:Hospitality Industry,Manufacturing,Warehouses ,Retail and Shopping Assistance.

We all are familiar with the robot technology. It is basically used to reduced human efforts .

Our cart will also work with the same goal. A person can control our cart with his commands given by him.

It has ability to detect any obstacle during her motion.

As it bears the self-billing facility it will save time of customer's.

Figure 1.1: General block diagram

1.2 Project Idea

We are going to make a cart/trolley which will have the following features:

A) It will work on the voice commands given by the user.

B) It will have the self-Obstacle avoiding ability.

C) It will also have the self-Billing mechanism attached to the cart.

1.3 Proposed Solution

Our cart will work in three stages:

Initially, user need to connect their phone with the cart via Bluetooth. Then according to the commands given by the user our cart will move/ carry out the given work. If in-between the cart will detect some obstacle then the cart will avoid that obstacle without the command of the user. Also, the cart will have the self-billing mechanism in it. So that the user will not have any need to visit the billing counter to take bill. It will also save the time of the user.

1.4 Motivation

Multi-Featured Cart: To develop a cart/trolley with the feature's like it should have the capability of self-billing of the products that the customer will buy. So that there is no need for the customer to visit billing counter and wait there in a row till his chance will come. It will save customer's time. Another feature that our cart will have is voice controlled. It means, our cart is going to move according to the commands that the user is going to give her. There is no need of user to move the by his hands. It will help to reduce human efforts and provide service to the user in better way. Along with this our cart will also have a feature of Self-Obstacle detection. While moving with the commands given by the user if, our cart will detect something in the way then it will avoid that obstacle itself.

1.5 Project Challenges

When undertaking a project to build a Multi-featured carts/trolley, some project-specific challenges you might face: Hardware Selection:Choosing the right combination of sensors for obstacle detection (such as ultrasonic sensors, infrared sensors, or cameras) and ensuring compatibility with the trolley's design can be a challenge. Integration of Sensors:Integrating different sensor data and synchronizing their inputs in real-time for effective obstacle detection requires careful consideration. Sensor fusion algorithms must be developed to provide accurate and reliable obstacle information.

Arduino UNO Programming:Programming the microcontroller or microprocessor to manage both voice commands and obstacle detection requires expertise in embedded systems. Efficient code is necessary to ensure real-time responsiveness. Motor Control and Actuators:Implementing precise motor control mechanisms for the trolley's movement, especially in response to obstacle detection or voice commands, requires careful consideration of the motor type, power, and control algorithms. Power Supply and Management:Designing a power supply system that can meet the energy demands of the trolley while ensuring longevity is critical. Battery life, charging cycles,

and power management must be considered. Communication Protocols:Establishing communication protocols between the voice recognition module, obstacle detection sensors, and the motor control system is essential. Ensuring reliable and low-latency communication is a significant challenge. User Interface Design:Creating an easy way for you to tell the trolley what to do and for the trolley to tell you what it's doing—kind of like having a simple conversation.. Testing and Iteration:Trying out the trolley in different places and situations to make sure it does what it's supposed to. If something doesn't work right, going back and fixing it. Cost Considerations:Making sure the trolley is good enough but also doesn't cost too much. Choosing parts and stuff that do the job well without breaking the bank. these challenges requires a systematic approach, involving prototyping, testing, and continuous requirements. Regular collaboration among team members with expertise in hardware, software, and robotics is essential for overcoming these obstacles and delivering a successful voice-controlled and obstacle detection trolley project.

1.6 Proposed Solution

Our cart will work in three stages:

Initially, user need to connect their phone with the cart via Bluetooth. Then according to the commands given by the user our cart will move/ carry out the given work. If in-between the cart will detect some obstacle then the cart will avoid that obstacle without the command of the user. Also, the cart will have the self-billing mechanism in it. So that the user will not have any need to visit the billing counter to take bill. It will also save the time of the user.

Chapter 2

Literature Review

2.1 Related work And State of the Art (Latest work)

The voice-controlled equipment in the project can be operated via user's instructions. An App is used to deliver commands to the cart. The connection in-between the application and the car is made possible through Bluetooth technology. This can be managed by a button on the application or a verbal command from the user. The multi-featured card is simpler to move thanks to 2 DC motors that are connected to the side of the receiver side of a microcontroller. The instruction received from the app is converted into a digital signal and sent using bluetooth module at the proper range .The command is decoded by the receiver and sent to the microcontroller at the very end of the apparatus.

2.2 Limitation of State of the Art techniques

•Voice assistants use single commands. Currently, most of them are pre-written sentences. In essence, they do one dial turn or one button press.

Voice assistants do not support one-way exchange. It is impossible for the appliances to respond by making their intentions clear. By adding checks to the skills utilised in the cloud, this problem is not totally overcome.

• The commands are independent of the state of the device. The user must be conscious of details like if an oven is on and when the heat should be lowered.

• In general, appliances are unable to initiate conversations or send out alerts, such as when a pot is about to boil over or a washing machine has done.

2.3 Discussion and future direction

This system can also be built using wireless communication technologies like Bluetooth and WI-FI. Along with the product information, the nutrition facts for the foods may also be supplied. The cart has the ability to automatically move and recognise tracks thanks to a number of sensor technologies. When the shopping budget limit has been surpassed, a buzzer should beep. customers cake make their shopping list also. This cart can be useful in many stores.

2.4 Concluding Remarks

So, we are going to create one multi-featured cart which will have the features like: It will be voice controlled, It will have the ability to avoid the obstacle if it is detected in her way.It will also contain the self-billing system in order to save the user time. we are going to use pic 8051 for creating the circuit of voice controller. For self obstacle detection we are using arduino. sililarly, for self-billing mechanism we will use arduino nano.

Chapter 3

Problem Definition and Scope

3.1 Problem statement

To create a multi-featured cart with features like:

1. Voice controlled. 2. Self-billing 3.Self-obstacle detection.

3.2 Goals and Objectives

The objectives for Multi-Featured Cart are as Follows: 1. Implement a reliable voice recognition system that can accurately interpret user commands and control the carts movement.

2. To make the cart voice controlled, Self-billing.

3. To provide a better service.

4. To save the consumers time as well as reduced Humans efforts.

5. Integrate sensor and algorithms to detect obstacles in the carts path enable it to navigate autonomously around them.

3.3 Scope and Major Constraints

We can also make the cart with facility like it will auto calculate the number of products store in it. We can increase the voice commands in our pode like turn back, reduced your spped.etc. This system can be used in Big shopping stores like D mart, Trends, etc. By adpoting this system, we can reduced human-power. It will save time as well as money. Use in factories and warehouses for material handling, reducing the need for manual labor. Healthcare Assistance:Assist in hospitals for transporting medical supplies or aiding patients with mobility challenges. Improve customer service by delivering items or information in retail stores or hotels. Aid individuals with mobility issues in homes or public spaces. Serve as a hands-on educational tool for students learning about robotics and artificial intelligence. Major Constraints of Multi Featured Carts is Sensor Accuracy and Limitations, Real-time Processing Requirements, Power Consumption,User Interface Challenges.Balancing these constraints while maximizing the scope and benefits of the Multi-Featured carts is the success and practical implementation of such systems.

3.4 Hardware and Software Requirements

1. Arduino UNO.
2. Ultrasonic Sensor
3. L293D Motor Driver .
4. Bluetooth module (HC-05).
5. Battery (12V).
6. Connecting wires.
7. Motors (required rpm).
8. Battery Holder
9. Jumper Wires.

10.Arduino Software (IDE)

12. Android Application

13. Wheels

3.5 Expected Outcomes

After the successful completion of our project, we are expecting that our model will work with proper accuracy. It will be voice controlled. The motion of our cart with be controlled through an application, Our model will also have the feature of self-billing. There is no need for customer to visit the billing center. It will also be self-obstacle detector. Whenever it is moving with reference of voice. If, in-between it will sense any obstacle. It will avoid that.

Chapter 4

System Requirement Specification

4.1 Overall Description

Multi-featured carts are becoming more common in many different fields, such as medicine, the military, education, and government. They are helping people in many ways, making our lives easier, better, and faster.the goals of this project is to develop a low-cost and easy-to-build multi-featured cart that can be used by people with disabilities to get around more independently.To make the cart safe and reliable by using obstacle detection and avoidance features. To make the cart user-friendly by using voice control.This project is about building a cart that can be controlled by voice commands and can avoid obstacles.The cart will be controlled by an app on your phone. The app sends your voice commands to the cart via Bluetooth. The cart also has a sensor that helps it to see obstacles. If the cart sees an obstacle, the five operation perform by the multi-featured cart are described as following: 1) Moving forward 2) Moving backward 3) Turning to the right 4) Turning to the left 5) Stop condition

4.1.1 Block diagram/ Proposed System setup

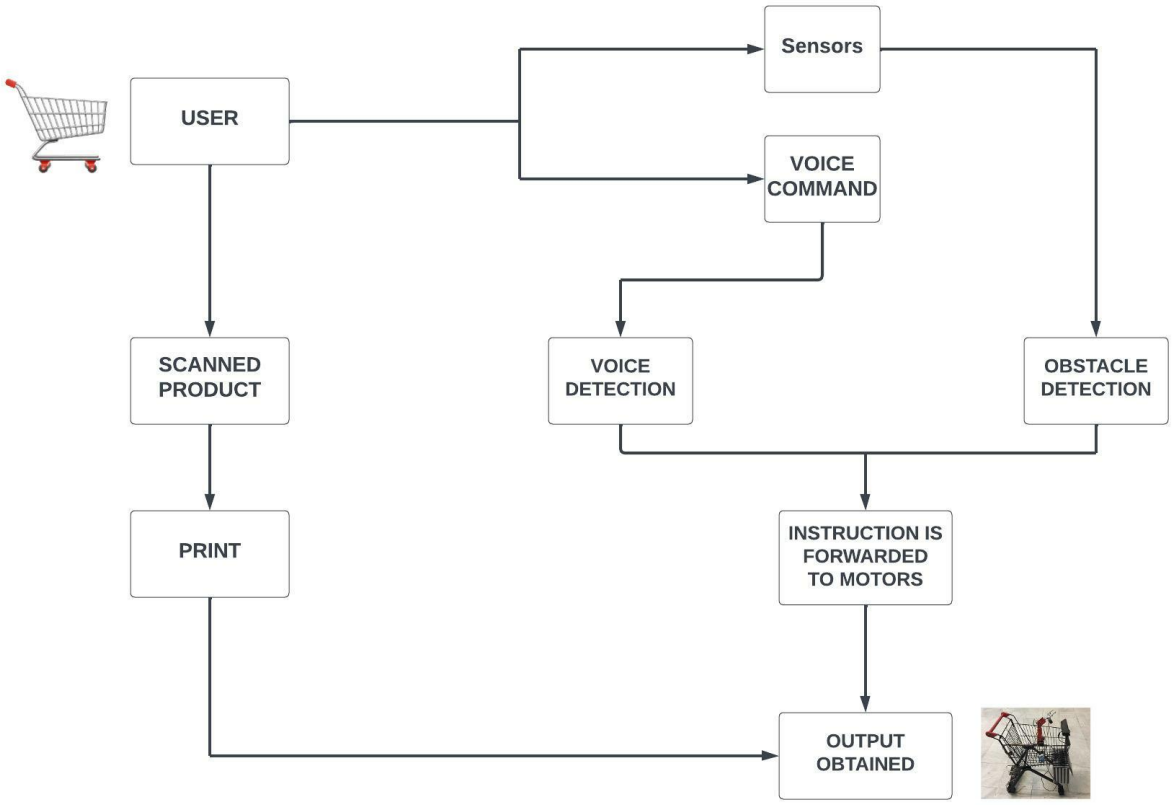

Figure 4.1: block diagram

4.1.2 Hardware and Software Requirements

1. Arduino UNO.

2.Arduino Software (IDE)

3. Ultrasonic Sensor

4. L293D Motor Driver .

5. Bluetooth module (HC-05).

6. Battery (12V).

7. Connecting wires.

8. Motors (required rpm).

9. Wheels.

10. Jumper Wires.

11. Battery Holder.

12.Android Application

• Arduino UNO:The Arduino Uno is a microcontroller board that can be programmed to control electronic devices. It has 14 digital pins and 6 analog pins that can be used to connect to sensors, motors, and other devices. It also has a USB port that can be used to connect it to a computer to program it and upload code to it.For example, the Arduino Uno could be programmed to control a motor to turn on a light when a button is pressed. It could also be programmed to control a sensor to turn on a fan when the temperature gets too high.The Arduino Uno is a versatile and powerful tool that can be used to create a variety of different projects. It is a great platform for learning about electronics and programming.

• Bluetooth Module (HC-05): The Bluetooth module (HC05) is a wireless communication device that allows microcontrollers to communicate with Bluetooth-enabled devices, such as smartphones. It uses serial communication to communicate with microcontrollers, and its default settings can be changed using at commands.The Bluetooth module can be used for various purposes, such as:Sending data between microcontrollers and Bluetooth-enabled devices, Controlling devices connected to the Bluetooth module,Creating wireless sensor networks,Developing wireless home automation systems. In the multi-featured cart project, the Bluetooth module is used to communicate between the Arduino Uno microcontroller and the Android app. The Android app sends voice commands to the Arduino Uno , and the Arduino Uno responds to the commands by controlling the cart's movement and other functions.

• Ultrasonic Sensor: It is used to detect obstacles in the trolley's path and avoid them. The HC-SR04 has four pins: VCC: This pin is used to power the sensor. Trig: This pin is used to trigger the sensor. When a pulse is applied to this pin, the sensor will transmit an ultrasonic wave. Echo: This pin is used to receive the echo of the

ultrasonic wave. GND: This pin is used to ground the sensor.In the multifeatured cart project, the ultrasonic sensor is connected to the Arduino Uno microcontroller. The Arduino Uno microcontroller uses the ultrasonic sensor data to determine if there is an obstacle in the carts path. If the Arduino Uno detects an obstacle, it will stop the trolley's motors and the trolley will stop moving.

• Motor Driver: The motor driver in the multi-featured cart is responsible for controlling the speed and direction of the trolley's motors. It is connected to the Arduino Uno microcontroller, which sends commands to the motor driver to control the trolley's movement.The motor driver is a dual H-bridge motor driver, which means that it can control two motors independently. This is necessary for the multi-featured cart, as it needs to be able to control the two motors of the trolley independently in order to move and turn.The motor driver is also responsible for providing enough current to the motors to drive the trolley. The trolley's motors require a significant amount of current to operate, so the motor driver needs to be able to provide this current. It allows the cart to move and turn in any direction, and it provides enough current to the motors to drive the cart.

• Battery: The battery in the voice-controlled obstacle detection trolley project is responsible for providing power to all of the trolley's components, including the Arduino Uno microcontroller, the motor driver, the ultrasonic sensor, the Bluetooth module, and the motors.The battery should be able to provide enough current to power all of the cart's components for a reasonable amount of time.

• Arduino Software (IDE): is a platform for writing and uploading code to Arduino boards. It is easy to use and makes it possible to create programs (or sketches) for the Arduino board.The IDE has a text editor for writing code, a message area for feedback, a console for displaying text output, and a toolbar with buttons for common functions.The IDE also includes a library of code that can be used in sketches. This library can be expanded by importing additional libraries from various sources.To get started with the IDE, you can import a library from a Zip file and use it in your sketch.

• Android Application: The Android application allows you to connect to the HC-05

module and allows you to send signals to Arduino so that it can perform the tasks you want successfully. The application sends 5 signals, numbers from 1 to 5 used to adjust the make agreement accordingly.

Chapter 5

Methodology

The methodology of the voice-controlled obstacle detection trolley project: Requirements gathering: The first step was to identify the requirements for the cart. This included determining the desired features of the cart, such as the ability to be controlled by voice commands, detect and avoid obstacles. System design: The next step was to design the system architecture of the cart. This included identifying the hardware and software components that would be needed, and how they would interact with each other. Hardware development: The next step was to develop the hardware components of the cart. This included assembling the Arduino microcontroller board, motor driver, ultrasonic sensor, and Bluetooth module. Software development: The next step was to develop the software components of the cart. This included writing the Arduino to control the cart's movement and other functions, and developing the Android app to send voice commands to the trolley. Integration and testing: Once the hardware and software components were developed, they were integrated and tested. This involved connecting the hardware components to the Arduino microcontroller board and uploading the board. The Android app was also installed on a smartphone and tested to ensure that it could send voice commands to the cart and receive feedback from the cart. Deployment: Once the system was integrated and tested, it was deployed. This involved making the multi-featured cart available to users.

5.1 System Architecture

So, basically the cart will contain four motors of 200 rpm which will be connected with the wheels of our cart. There will be 3 different circuit connection for 3 different features that cart. For voice control there will be a Bluetooth module (HC-05) attached in the circuit through which user will be able to give commands to the cart using his phone. According to the commands given the instruction will be forwarded to the motors and we will get our desired output. For this we are going to use PIC8051 microcontroller. We are going to input a particular code in it so that according to the given command the designed instruction will be forwarded to the motors. For self-Obstacle detection: For this we are going to use Sensors and Arduino in it. It will also have the connection with the motors. If the sensors will sense any obstacle it will detect that and forward the instruction to the motors as per, we have coded it in Arduino. In this way we will get our desired output. Along with this our cart will also have the self-billing mechanism in it. User need to scan the product on RFID reader and then put it int the cart. And at the end after clicking on the key, he will get bill there only.

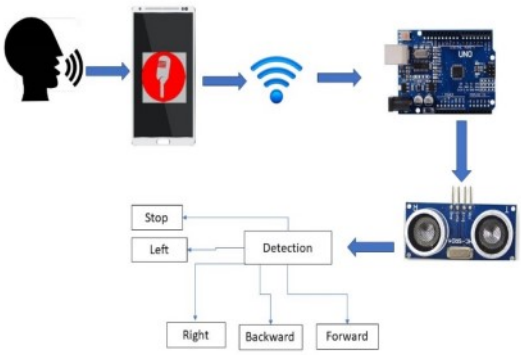

Figure 5.1: block diagram

5.2 Objective Function

Function: Make the Trolley Listen to You Details: Train the trolley to understand and do what you say. So, when you talk to it, it does what you want, like a good listener. Function: Give the Trolley "Eyes" and a "Brain" Details: Put special

sensors on the trolley to help it see obstacles, and teach it to be clever enough to go around them safely. It's like giving it eyes to see and a brain to think so it doesn't bump into things.

5.3 Approach

We want to develop a cart which will work with multi features. Our main motive is to reduce human efforts and save human's time. So, for that we are going to create a cart with features like: It will be controlled by the users voice. There is no need for the user to drag the cart. It will also be the self-obstacle detector and also has the feature of self-billing.

Chapter 6

Implementation

6.1 System Implementation

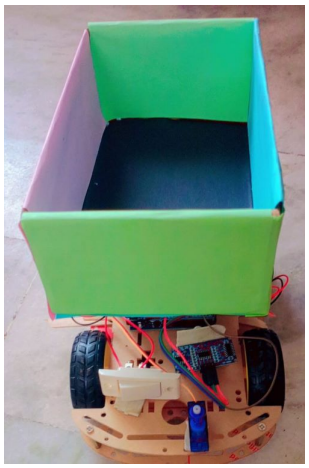

Figure 6.1: Hardware Implementation

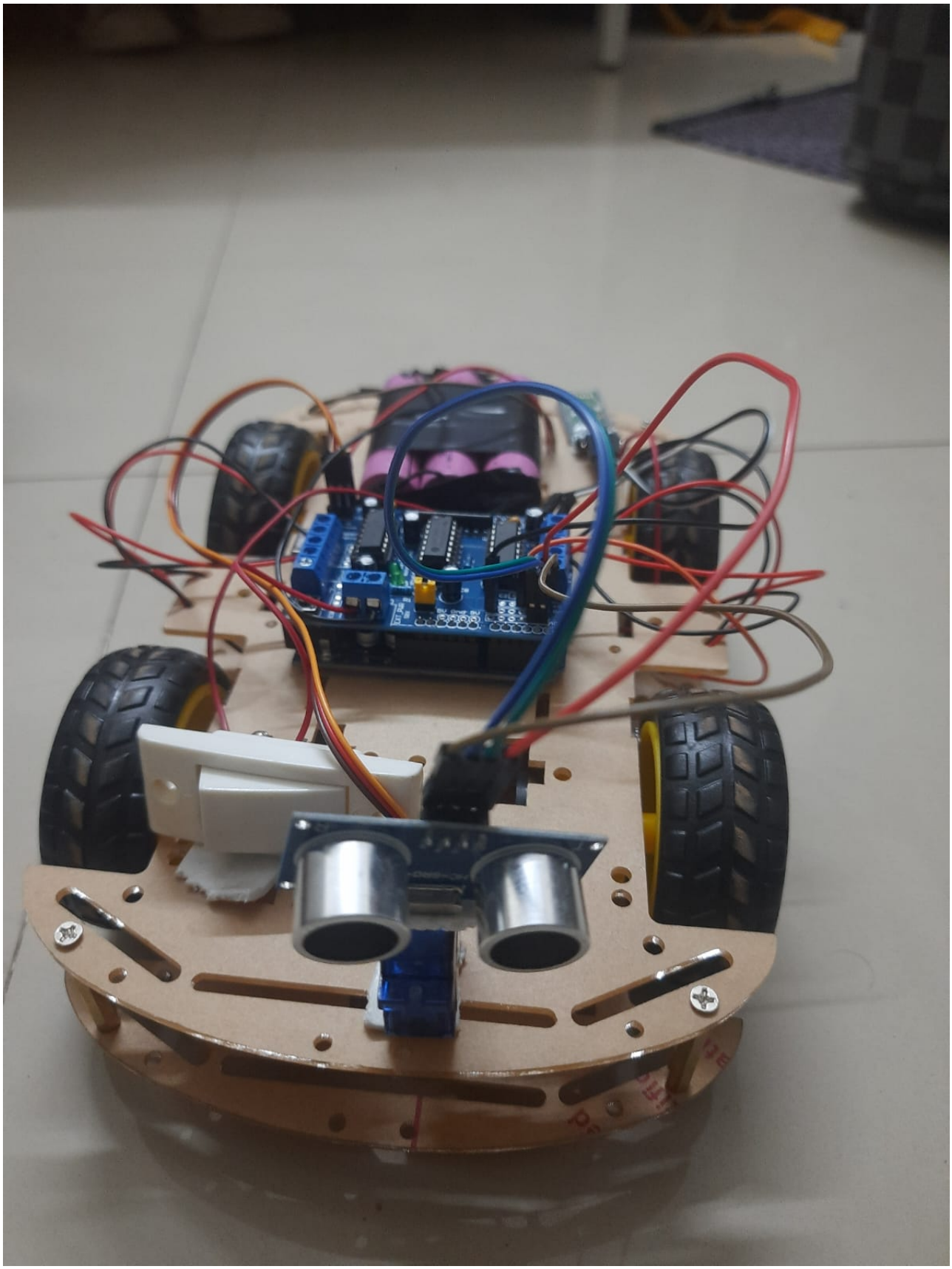

Figure 6.2

6.2 Standard Industry practice adopted

Introduction:

Multi-featured carts are becoming more common in many different fields, such as medicine, the military, education, and government. They are helping people in many ways, making our lives easier, better, and faster.the goals of this project is to develop a low-cost and easy-to-build multi-featured cart that can be used by people with disabilities to get around more independently.To make the cart safe and reliable by using obstacle detection and avoidance features. To make the cart user-friendly by using voice control.This project is about building a cart that can be controlled by voice commands and can avoid obstacles.The cart will be controlled by an app on your phone. The app sends your voice commands to the cart via Bluetooth. The cart also has a sensor that helps it to see obstacles. If the cart sees an obstacle, the five operation perform by the multi-featured cart are described as following: 1) Moving forward 2) Moving backward 3) Turning to the right 4) Turning to the left 5) Stop condition

Objective: The objective of Standard Industry Practices for the Multi-Featured Cart/Trolley is to ensure safety, user-friendliness, and efficiency. This involves compliance with safety standards, user-friendly design, reliable obstacle detection, scalability, seamless integration with plant systems, cost-efficiency, optimized ergonomics, durability, interoperability, and comprehensive training/documentation. The goal is to establish a benchmark for excellence in industrial applications.

Industry Overview: Multi-featured Cart/ trolley are part of a growing trend in industrial automation. They enhance efficiency and safety in material handling by enabling hands-free operation and preventing collisions. Integrated with Industry principles, these trolleys offer real-time data exchange and find applications across industries, emphasizing ergonomic design, costeffectiveness, and adherence to safety standards. Ongoing developments focus on user-friendly interfaces, interoperability, and compliance with regulatory requirements.

Standard Industry Practices: 1. Real-time Command Processing: To achieve seam-

less control, it's crucial to establish procedures that enable the swift and accurate interpretation of voice commands. This involves employing advanced speech recognition technology and efficient processing algorithms to swiftly translate spoken instructions into actionable commands for the trolley. 2. Sensor for Obstacle Detection: A cornerstone of the project lies in the integration of sensors for obstacle detection. Standard practices involve selecting sensors that integrate seamlessly with the voice-controlled system, considering reliability under diverse conditions, and ensuring precise calibration. Well-integrated sensors provide a comprehensive view of the surroundings, enabling the trolley to navigate and avoid obstacles effectively. 3. Predictive Safety Measures: Predictive analytics, tailored for obstacle detection, forms the intelligence core of the Voice Controller and Obstacle Detection Trolley. By leveraging machine learning algorithms and statistical models, historical data is analyzed to foresee potential obstacles and optimize navigation routes. This proactive approach significantly minimizes the risk of collisions, ensuring a safe operational environment. Case Studies/Examples: Illustrative examples of successful MultiFeatured Cart implementations in similar industries provide tangible evidence of the impact of standard practices. These case studies highlight situations in which following best practices led to increased performance, decreased downtime, and improved operational efficiency.

Implementation Recommendations: Building upon the identified practices, our recommendations for the implementation of these practices in the software and hardware of the project include detailed considerations for technology selection. This involves carefully assessing the solutions that are available, as well as how well they work with the current infrastructure and how scalable they are to meet changing needs. Comprehensive training programs should also be created to equip staff members with the knowledge and abilities needed to efficiently operate and interpret data from area. During the implementation stage, anticipated difficulties like possible system integration problems or data security issues should be handled in a proactive manner.

Benefits of Adhering to Standard Practices: Numerous advantages are expected if the "Multi-Featured Cart/Trolly" project adheres to industry standards. Enhanced safety via early fault detection, lower maintenance costs, better reliability, and higher

overall operational efficiency are some of the main benefits. Our project's compliance with industry standards not only guarantees its success but also establishes our company as a leader in the field dedicated to quality and innovation.

Conclusion: The multi-featured cart is a promising project with the potential to make a real difference in the lives of people with disabilities and in other applications. The project has successfully demonstrated the feasibility of building a lowcost, easy-touse, and reliable trolley that can be controlled by voice commands and can detect and avoid obstacles. Voice control is a user-friendly and accessible way to control a trolley for people with disabilities. Ultrasonic sensors are a reliable and effective way to detect obstacles in the carts path. The Arduino UNO is a powerful and versatile platform for controlling the multi-featured cart's movement and other functions. Voice recognition algorithms can be used to accurately interpret voice commands and translate them into actions that the carts can perform. The project has also identified some areas for future work, such as improving the accuracy of the developing a more durable obstacle detection , adding additional features to the cart, and making the trolley more portable and rugged. The multi-featured cart is a well designed and well-executed project that has produced a valuable and useful product.

Chapter 7

Conclusion

7.1 Conclusion

So, we are going to create one multi-featured cart which will have the features like: It will be voice controlled, It will have the ability to avoid the obstacle if it is detected in her way.It will also contain the self-billing system in order to save the user time. we are going to use pic 8051 for creating the circuit of voice controller. For self obstacle detection we are using arduino. sililarly, for self-billing mechanism we will use arduino nano. The system design for multi-featured cart/trolly was properly checked for any failures and recommended for developing a prototype.

7.2 Future Scope

We can also make the cart with facility like it will auto calculate the number of products store in it.

We can increase the voice commands in our code like turn back, reduced your spped,etc.

This system can be used in Big shopping stores like D mart, Trends, etc.

By adpoting this system, we can reduced human-power.

It will save time as well as money.

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