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COLLEGE OF ENGINEERING
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Thalavapalayam, Karur – 639 113.

AUTOMATED SUPER MARKET TROLLEY

A MINOR PROJECT- II REPORT

Submitted by

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BACHELOR OF ENGINEERING

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M.KUMARASAMY COLLEGE OF ENGINEERING

(Autonomous)

KARUR – 639 113

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M.KUMARASAMY COLLEGE OF ENGINEERING KARUR

BONAFIDE CERTIFICATE

Certified that this **18ECP104L - Minor Project II** report "**AUTOMATED SUPER MARKET TROLLEY"** is the bonafide work of **SACHIN.K(92722BEC169), SETHUPATHI.S (927622BEC181), RANJITHKUMAR.R (927622BEC164), SIBICHAKARAVARTHY.K. S (927622BEC190)** who carried out the project work under my supervision in the academic year **2023 – 2024 EVEN SEMESTER**

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This report has been submitted for the **18ECP104L – Minor Project-II** final review held at M. Kumarasamy College of Engineering, Karur on _____

PROJECT COORDINATOR

INSTITUTION VISION AND MISSION

Vision

To emerge as a leader among the top institutions in the field of technical education.

Mission

M1: Produce smart technocrats with empirical knowledge who can surmount the global challenges.

M2: Create a diverse, fully engaged, learner -centric campus environment to provide quality education to the students.

M3: Maintain mutually beneficial partnerships with our alumni, industry and professional associations.

DEPARTMENT VISION, MISSION, PEO, PO AND PSO

Vision

To empower the Electronics and Communication Engineering students with emerging technologies, professionalism, innovative research and social responsibility.

Mission

M1: Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.

M2: Inculcate the students in problem solving and lifelong learning ability.

M3: Provide entrepreneurial skills and leadership qualities.

M4: Render the technical knowledge and skills of faculty members.

Program Educational Objectives

PEO1: **Core Competence:** Graduates will have a successful career in academia or industry associated with Electronics and Communication Engineering

PEO2: **Professionalism:** Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of Electronics and Communication Engineering.

PEO3: **Lifelong Learning:** Graduates will contribute to the social needs through lifelong learning, practicing professional ethics and leadership quality.

Program Outcomes

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.

PSO2: Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to fulfil the industrial expectations.

Abstract	Matching with POs, PSOs
Shopping Trolley, Arduino UNO, Billing system, Ultrasonic Sensor	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2**

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Our sincere thanks to **Thiru.M.Kumarasamy, Founder** and **Dr.K.Ramakrishnan,Chairman** of **M. Kumarasamy College of Engineering** for providing extraordinary infrastructure, which helped us to complete this project in time.

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ABSTRACT

Supermarkets are almost developed with many technological advancements. People purchase different items from the supermarkets and put them into a trolley because it is the easiest method used in supermarkets to carry goods. However, throughout the whole process of shopping, customer must push the trolley manually by their own effort. Therefore, if a customer carries a baby while shopping it is a real burden to the customer to push the trolley or to a disabled person with one hand is almost impossible to push the trolley. This project aims to develop an automated human-following system for supermarket trolleys. Using computer vision and sensor fusion, the system will enable seamless navigation, enhancing the shopping experience by providing a hands-free solution for customers. The integration of machine learning algorithms will ensure robust and adaptive tracking, optimizing the trolley's movement while maintaining a safe and user-friendly environment within the supermarket. So that customers can enjoy shopping without pushing trolley themselves. An automatic supermarket trolley integrated with an Arduino-based billing system automates item scanning and billing as customers shop. Components include an RFID reader for item identification, a load cell for weight measurement, an LCD for displaying totals, and a wireless module for data transmission. This setup provides real-time billing updates, reducing checkout time and improving shopping efficiency.

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LIST OF ABBREVIATIONS

ACRONYM	ABBREVIATION
IDE	Integrated Development Environment
MCU	Microcontroller unit

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Shopping carts in the supermarkets in day today shopping activities is now visible. Customers are pushing trolleys around them to carry the items purchased. The usual process of travelling the trolley is done manually by the human with the effort of his/her. Therefore, if a customer carries a baby while shopping it is a real burden to the customer to push the trolley or to a disabled person with one hand is almost impossible to push the trolley. People can see huge rush in supermarkets on holidays and weekends the rush is even more when there are special offers and discounts. Trolley that is capable of carrying goods while following the customer automatically without human effort, an android application has developed which gives suggestions about goods while purchasing for this a tablet is fixed to trolley with an android platform to function the abovementioned task.

1.2 SUPERMARKETS

Supermarkets are bustling hubs where myriad products await. Bright aisles guide shoppers through a maze of choices. Fresh produce gleams under vibrant lights, inviting scrutiny. A symphony of scents intermingles in the air: from baked goods to floral fragrances. Carts navigate the aisles, laden with goods of every kind Checkout lines weave like intricate tapestries as transactions hum along. Employees bustle,restocking shelves or aiding customers with cheerful efficiency Supermarkets: where everyday necessities meet a mosaic of consumer experiences Supermarkets are large retail stores that offer a wide variety of food and household.

products. They typically organize products into aisles for easy navigation Supermarkets often carry fresh produce, meat, dairy, canned goods, and more.

1.3 TROLLEY'S USED IN SUPER MARKETS

The primary and simple use of a trolley in a supermarket is to assist customers in carrying and organizing their selected items during their shopping trip. Here's a breakdown of the straightforward use of a trolley in a supermarket. Customers use the trolley to collect various products from different sections of the supermarket. This includes groceries, household items, and other goods they intend to purchase.

Fig 1.1 : Exsisting method of shopping troley

CHAPTER 2

LITERATURE SURVEY

2.1 CONTROL SYSTEM

The Arduino Uno is based on the ATmega328P microcontroller, which serves as the brain of the system. It's responsible for running code and controlling the connected hardware. The operating voltage for an Arduino Uno is 5V. The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller (MCU) and developed by Arduino.cc and initially released in 2010.The microcontroller board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by a USB cable or a barrel connector that accepts voltages between 7 and 20 volts, such as a rectangular 9-volt battery.

2.2 WORKING SYSTEM

The brain of the system, responsible for processing data, running control algorithms, and coordinating the functions of other components. Arduino, Raspberry Pi, or specialized microcontrollers may be used.sensors are essential for environmental awareness and navigation. Actuators are responsible for physical movement or

manipulation. Software that governs the behavior of the trolley. This includes navigation algorithms, obstacle avoidance strategies, and task-specific control logic. Typically a battery or rechargeable power source that provides the energy needed for the trolley's operation.

2.3 SENSOR SYSTEM

Ultrasonic sensors work based on the principle of sending and receiving ultrasonic waves. The sensor typically consists of a transmitter and a receiver. Emits ultrasonic waves, usually at a frequency above the range of human hearing (typically 40 kHz or higher). Receiver detects the reflected ultrasonic waves after they bounce off an object. The time taken for the waves to return is used to calculate the distance to the object. The accuracy of distance measurement depends on the quality of the sensor and the environment. Factors such as temperature and air humidity can affect accuracy. Ultrasonic sensors may face challenges in certain environmental conditions, such as extremely noisy or windy environments. Additionally, they may have difficulty detecting certain materials or objects with irregular shapes.

2.4 MOTOR DRIVER SYSTEM

A motor driver is an electronic device or module that controls the movement and operation of an electric motor. It interprets signals from a control system, typically a microcontroller or processor, and regulates the electrical power supplied to the motor. Motor drivers are essential in various applications where precise control of motor speed, direction, and torque is required.

CHAPTER 3

EXISTING SYSTEM

3.1 METHODOLOGY

The methodology used in automated supermarket trolleys typically involves incorporating sensors, cameras, and navigation systems. These systems allow the trolley to navigate through the store autonomously, avoiding obstacles and following predefined paths. Arduino used to control the motors and other components. Additionally, AI algorithms may be employed to optimize the trolley's route and enhance its overall efficiency.

Fig 3.1 : Block diagram

3.2 WORKING PROCESS

In this project . when the machine the sensor will decet the motion of the person if the person is in motion it will start the motor and follows the person . In case if the person is not in motion it will stop the power supply and stays at rest .we propose the automations regulation to follow the humans if the are in moment . if the person is in the moment it will start the the motion and follows the person if he stops the motion it will stop the motion stop the power supply.

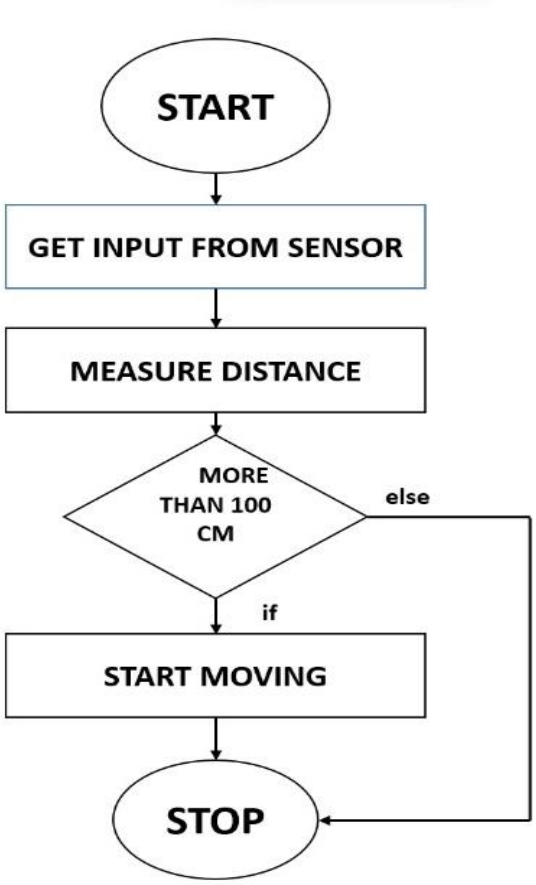

Fig 3.2 : Flow chart

CHAPTER 4

PROPOSED SYSTEM

4.1 COMPONENTS

1.Arduino uno.

2.Ultrasonic sensor.

3.Lithium ion Battery.

4.Servo Motor.

5.Motor driver shield.

6.Dc motors.

4.2 PLANNING

According to the research papers that the research group went through no trolley performs automatic parking facility after the purchases are finished by the customers. Moreover, while the trolley is parked within the slot its battery will charge automatically. Since the research is based on an electronic device its battery must be charged to get work from it. According to the developed trolleys the battery is charged manually with help of a human to plug the device. Considering all the facts the research group came up with an intelligent trolley which performs multifunctional tasks to make shopping life easier. The prototype methodology was used to achieve the project goals. Planning, Analysis, Designing and Implementation phases were executed concurrently and iterated until the project reached all the objectives and the users were satisfied with a final prototype.

4.3 BILLING SYSTEM

An automatic supermarket trolley integrated with an Arduino-based billing system revolutionizes the shopping experience by automating item scanning and billing as customers place items into the trolley. The key components of this system include an Arduino microcontroller, which acts as the brain of the system by processing inputs and controlling outputs. An RFID reader is used to identify items with RFID tags as they are placed in the trolley, ensuring accurate item recognition. A load cell and prevent theft. An LCD display provides real-time billing information to the customer, showing item details and the total cost. A keypad allows customers to input special codes or interact with the system for custom functionalities. A wireless module, such as Wi-Fi or Bluetooth, transmits billing data to a central server or point-of-sale system for seamless integration. A thermal printer prints receipts once the shopping is complete, offering a physical record of the transaction. A reliable power supply ensures all components are adequately powered for continuous operation. This system enhances the shopping experience by providing instant billing updates, reducing checkout time, and improving accuracy and efficiency in handling transactions. The integration of RFID and weight measurement ensures security and accuracy, while wireless communication allows for easy data management and reporting. An automatic supermarket trolley integrated with an Arduino-based billing system automates item scanning and billing as customers shop. Components include an RFID reader for item identification, a load cell for weight measurement, an LCD for displaying totals, and a wireless module for data transmission. This setup provides real-time billing updates, reducing checkout time and improving shopping efficiency.

CHAPTER 5

COMPONENTS USED

5.1 ARDUINO UNO

The Arduino Uno is based on the ATmega328P microcontroller, which serves as the brain of the system. It's responsible for running code and controlling the connected hardware. The operating voltage for an Arduino Uno is 5V. The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller (MCU) and developed by Arduino.cc and initially released in 2010. The microcontroller board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. [1] The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by a USB cable or a barrel connector that accepts voltages between 7 and 20 volts, such as a rectangular 9-volt battery.

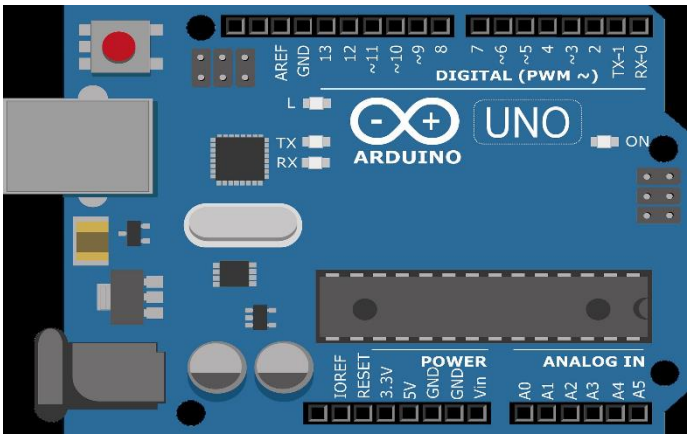

Fig 5.1 : Arduino UNO

It has the same microcontroller as the Arduino Nano board, and the same headers as the Leonardo board. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

5.2 MOTOR DRIVER

A motor driver is an electronic device or module that controls the speed and direction of an electric motor. It is commonly used in robotics, automation, and various electronic projects where precise motor control is required. Here are some key points about motor drivers. Motor drivers are designed for specific types of motors, such as DC motors, stepper motors, or servo motors. Motor drivers are widely used in applications such as robotics, CNC machines, 3D printers, electric vehicles, and more.

5.3 ULTRASONIC SENSOR

An ultrasonic sensor is a device that uses ultrasonic sound waves to measure distance and detect objects.Ultrasonic sensors work on the principle of sending out ultrasonic waves (sound waves with a frequency higher than the audible range for humans) and measuring the time it takes for the waves to bounce back after hitting an object. Widely used in robotics, industrial automation, parking sensors, obstacle detection

in autonomous vehicles, liquid level measurement, and more . Ultrasonic sensors typically provide analog or digital output, indicating the distance or the presence of an object.

Fig 5.2 : Ultrasonic sensor

5.4 SERVO MOTOR

A servo motor is a rotary actuator that allows for precise control of angular position, velocity, and acceleration. Servo motors are designed to maintain a specific angular position of the output shaft, controlled by an input signal. They are widely used in applications requiring accurate and controlled motion. Servo motors consist of a DC motor, a gearbox (for torque amplification), and a control circuit. The control circuit interprets the input signal and adjusts the motor's position accordingly.

5.5 DC GEARED MOTOR

A DC geared motor is a type of DC motor that is integrated with a gearbox to provide controlled and precise motion at reduced speeds with increased torque. Here are some key points about DC geared motors . A gearbox, often comprised of gears, is coupled to the output shaft of the DC motor. This combination allows for a reduction in speed and an increase in torque. DC geared motors find applications in various fields, including robotics, conveyor systems, electric vehicles, industrial automation, and home appliances. DC geared motors are known for their efficiency in converting electrical power into mechanical power, especially when matched to the requirements of the application.

Fig 5.3: DC geared motor

CHAPTER 6

MERITS AND DEMERITS

6.1 MERITS

1.Convenience :

Provides a convenient way for people to transport items without the need to physically push or pull a traditional trolley.

2.Reduces Physical Strain :

Minimizes physical strain on users, especially in environments where long-distance travel or heavy lifting is required.

3.Cost Savings :

Over the long term, automated human-following trolleys may contribute to cost savings by increasing efficiency and potentially reducing the need for manual labor in certain tasks.

6.2 DEMERITS

1.Technical Challenges :

Dependence on complex technology introduces the risk of technical glitches, malfunctions, or system failures, which could disrupt the shopping experience.

2.Initial Cost :

The implementation of automated systems can involve significant upfront costs for the technology, infrastructure, and maintenance, potentially impacting the overall cost of operating a supermarket.

3.Reduced Human Interaction :

The introduction of automated systems could reduce human interactions in stores, impacting the personal touch and customer service aspects that some shoppers value.

4.Environmental Impact :

The production and disposal of complex automated systems may have environmental implications, including resource consumption and electronic waste.

CHAPTER 7

RESULT AND CONCLUSION

7.1 RESULT

In discussions and analyses surrounding automated supermarket trolleys, stakeholders emphasize the importance of balancing technological advancements with user-friendliness, ensuring data privacy, minimizing environmental impact, and continuously refining these systems to meet evolving customer needs. As these discussions evolve, collaboration among retailers, technology developers, policymakers, and consumers remain crucial in shaping the future of automated 20 shopping experiences. The implementation of automated supermarket trolleys has yielded several notable results and triggered discussions across various dimensions, shaping the retail landscape and customer shopping experiences. Automated trolleys have significantly improved the overall shopping experience for customers.

7.2 CONCLUSION

In conclusion, the evolution of automated supermarket trolleys has marked a significant step towards revolutionizing the retail landscape, enhancing customer experiences, and optimizing store operations. These innovations have showcased remarkable improvements in efficiency, convenience, and data-driven insights. However, challenges persist, and further advancements and considerations are necessary for the continued success and evolution of this technology. By reducing

checkout times, providing personalized recommendations, and enhancing convenience, these trolleys have positively impacted the overall shopping journey for customers. Retailers have benefited from increased efficiency in managing inventory, optimizing layouts, and making data-driven decisions that improve store operations and profitability. Exploring cost-effective solutions and ensuring accessibility for businesses of varying sizes will be crucial in widespread adoption. Research and development should focus on incorporating cutting-edge features like biometric authentication, predictive analytics, or contactless payment methods to further enhance the shopping experience. In conclusion, while automated supermarket trolleys have already demonstrated immense potential in transforming retail, ongoing research, collaboration, and innovation will be pivotal in overcoming challenges and further optimizing these systems. By addressing existing limitations and embracing future advancements, automated trolleys hold the promise of reshaping the retail landscape for an even more efficient, convenient, and personalized shopping experience.

CHAPTER 8

FUTURE WORK

We are going to make a billing system, packaging system in our project in future work which will make the billing in the shopping trolley itself. Continuous improvement in user interfaces, guidance systems, and customer education can encourage broader consumer adoption and satisfaction. Exploring cost-effective solutions and ensuring accessibility for businesses of varying sizes will be crucial in widespread adoption. Research and development should focus on incorporating cutting-edge features like biometric authentication, predictive analytics, or contactless payment methods to further enhance the shopping experience. In conclusion, while automated supermarket trolleys have already demonstrated immense potential in transforming retail, ongoing research, collaboration, and innovation will be pivotal in overcoming challenges and further optimizing these systems. By addressing existing limitations and embracing future advancements, automated trolleys hold the promise of reshaping the retail landscape for an even more efficient, convenient, and personalized shopping experience.

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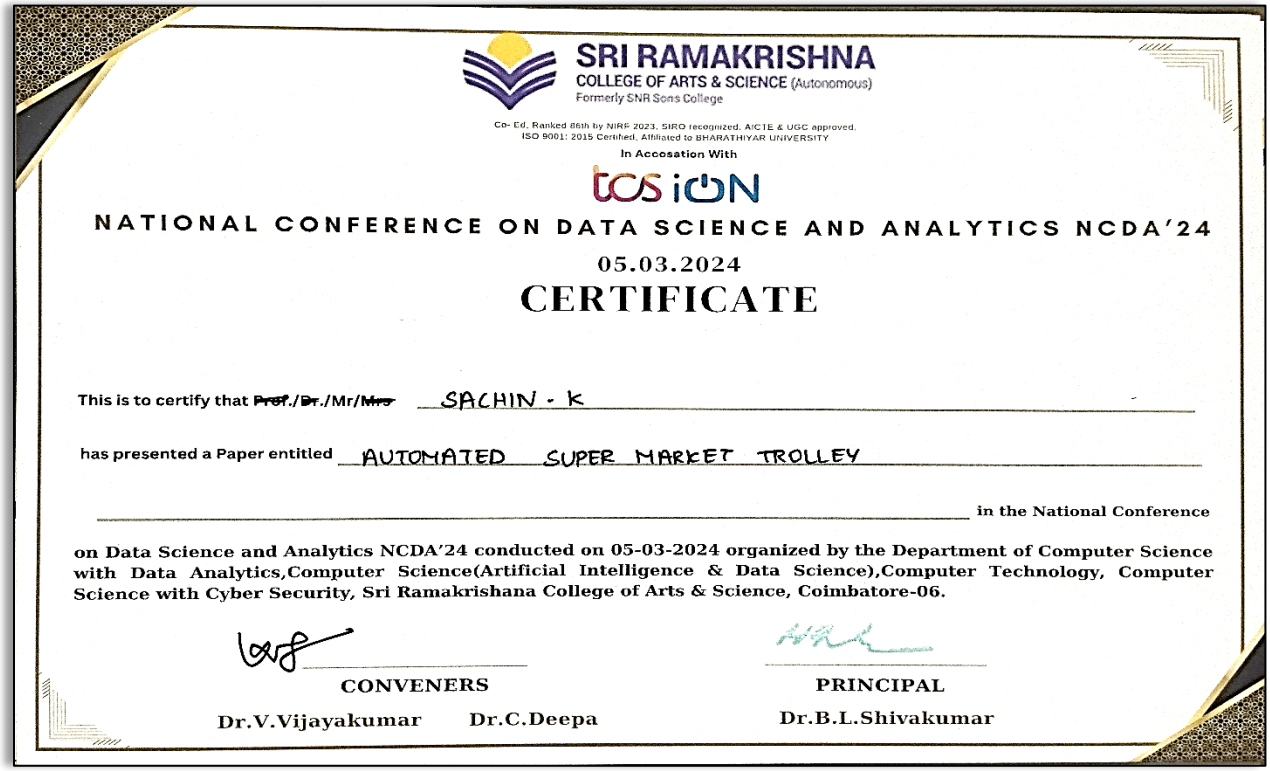

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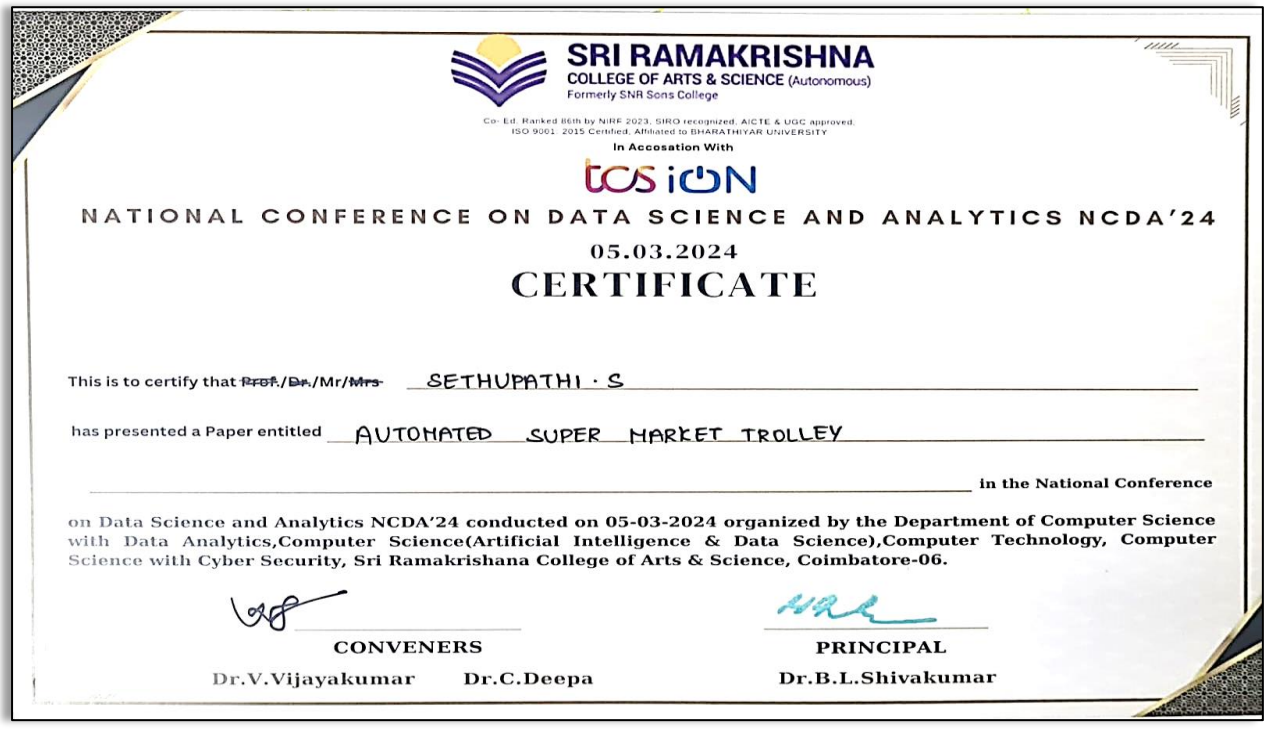

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Automated Super Market Trolley

Sachin. K Sethupathi. S Ranjith Kumar. R, Sibichakaravarthy. K. S

Abstract----Supermarkets are almost developed with many technological advancements. People purchase different items from the supermarkets and put them into a trolley because it is the easiest method used in supermarkets to carry goods. However, throughout the whole process of shopping, customer must push the trolley manually by their own effort. Therefore, if a customer carries a baby while shopping it is a real burden to the customer to push the trolley or to a disabled person with one hand is almost impossible to push the trolley. This project aims to develop an automated human-following system for supermarket trolleys. Using computer vision and sensor fusion, the system will enable seamless navigation, enhancing the shopping experience by providing a hands-free solution for customers. The integration of machine learning algorithms will ensure robust and adaptive tracking, optimizing the trolley's movement while maintaining a safe and user-friendly environment within the supermarket. So that customers can enjoy shopping without pushing trolley themselves.

Keywords---Supermarket, Trolley, Ardiuno,Dc Motor,Battery, Servo Motor

1. INTRODUCTION

Shopping carts in the supermarkets in day today shopping activities is now mostly visible. Customers are pushing trolleys around them to carry the items purchased. The usual process of travelling the trolley is done manually by the human with the effort of his/her. Therefore, if a customer carries a baby while shopping it is a real burden to the customer to push the trolley or to a disabled person with one hand is almost impossible to push the trolley. People can see huge rush in supermarkets on holidays and weekends the rush is even more when there are special offers and discounts.

2. SUPERMARKETS

Supermarkets are bustling hubs where myriad products await. Bright aisles guide shoppers through a maze of choices. Fresh produce gleamsunder vibrant lights, inviting scrutiny. A symphony of scents intermingles in the air: from baked goods to floral fragrances. Carts navigate the aisles, laden with goods of every kind Checkout lines weave like intricate tapestries as transactions hum along. Employees bustle, restocking shelves or aiding customers with cheerful efficiency Supermarkets: where everyday necessities meet a mosaic of consumer experiences Supermarkets are large retail stores that offer a wide variety of food and household. products. They typically organize productsinto aisles for easy navigation Supermarkets often carry fresh produce, meat, dairy, canned goods, and more.

3.LITERATURE SURVEY

To conduct a literature review for an automatic supermarket trolley, you'll want to explore research papers, articles, and patents related to topics such as:

1.*Autonomous Navigation:* Look for studies on autonomous navigation systems for robots or vehicles. Focus on techniques applicable to indoor environments, obstacleavoidance, and path planning.

2.*Sensing Technologies:* Investigate various sensors like LiDAR, ultrasonic sensors, cameras, and RFID systems used for environment perception, object detection, and tracking.

3.*Control Systems:* Examine control algorithms for maintaining stability, adjusting speed, and responding to dynamic environments. PID controllers, fuzzy logic, and machine learning approaches may be relevant.

4. *User Interaction:* Explore human- machine interaction studies, including user interfaces, gesture recognition, voice commands, and mobile applications for controlling or communicating with the trolley.

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