PROJECT QUICKY

Automated Contactless Delivery System Using Bluetooth Car and RFID Locker

Course Code : EEE 324
Course Title : Digital Electronics Lab

Submitted to,
Md. Shariful Islam
Lecturer
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Submitted by,
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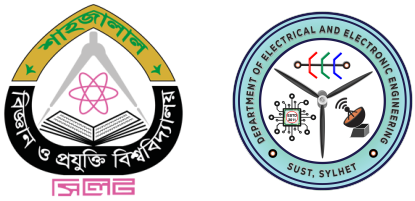

Department of Electrical & Electronic Engineering
Shahjalal University of Science and Technology, Sylhet

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PROJECT PROPOSAL LETTER

To,
Md. Shariful Islam
Lecturer
Department of Electrical and Electronic Engineering
Shahjalal University of Science and Technology, Sylhet

Course Code: 324
Course Title: Digital Electronics Lab

Respected Sir,
With due respect, we are submitting the project proposal for your kind consideration and approval as part of the **Digital Electronics Lab** (Course Code: 324). The project details are as follows:

- **Project Title:** PROJECT QUICKY : Automated Contactless Delivery System Using Bluetooth Car and RFID Locker.
- **Project Duration:** 2 months
- **Project Objective:** To develop a Bluetooth-controlled robotic car integrated with an RFID-based locker system for secure, contactless food delivery in small cafes and juice bars.
- **Team Members:**
  - Md Hasin Mahtaf (2021338035)
  - Toma Rani Barmon (2021338036)
  - Md. Asad Shekh (2021338037)
  - Md. Esahak (2021338038)
- **Tools/Technologies:** ESP32, RC522 RFID Module, Servo Motor, DC Motors, Bluetooth Communication, Arduino IDE
- **Expected Outcome:** A functional prototype of a Bluetooth-controlled robotic delivery system with secure RFID locker access.
- **Estimated Budget:** 4,300 BDT

We will be working on this project under your supervision and will submit progress reports and demonstrations as required. Kindly accept this proposal for your kind consideration.
Thank you.

Sincerely,
Md Hasin Mahtaf, Toma Rani Barmon, Md. Asad Shekh, Md. Esahak
Department of Electrical and Electronic Engineering
Shahjalal University of Science and Technology, Sylhet

SECTION A: EXECUTIVE SUMMARY

1.1 Executive Summary

In the era of rapid digital transformation, even small businesses must adapt innovative technologies to remain competitive and improve service quality. This project proposes the development of a Bluetooth-controlled robotic delivery car integrated with an RFID-based secure locker system, specifically designed for small-scale juice bars and cafes in parks or food courts. The aim is to automate the food delivery process and introduce a contactless, customer-friendly service model.

Through this system, customers will place their orders either through a vending machine or manually with a shopkeeper. After payment, they will receive an RFID card, which grants them secure access to their food delivery. A Bluetooth-controlled robotic car will carry the food to the customer's location, where the customer will use their RFID card to unlock the food locker controlled by a servo motor. This reduces manual handling, improves hygiene, and provides a modern service experience.

Although the vending machine is not within the project's current scope, the core components Bluetooth controlled robotic delivery and the RFID-secured locker—will showcase how digital technologies such as wireless communication, microcontroller automation, and secure access systems can streamline small business operations. This project not only introduces an efficient delivery mechanism but also promotes the practical adoption of digital technology in everyday business scenarios, encouraging small businesses to embrace the benefits of automation and smart solutions.

SECTION B: PROJECT DESCRIPTION AND CONTENTS

2.1 Problem Definition

In small parks, food courts, and open-air marketplaces, juice bars and cafes often face challenges in managing customer service during busy hours. Customers typically have to wait in queues to order and later again to collect their food, which leads to crowding, delays, and an overall inconvenient experience. Moreover, in open areas, once customers find a place to sit, it becomes difficult for them to track when their order is ready, often requiring them to leave their seats to collect it. This not only interrupts their leisure time but also creates congestion around the serving counter. Additionally, in today's health-conscious world, minimizing human contact in food service is essential for better hygiene. Therefore, there is a growing need for an efficient, contactless delivery system that can streamline the order and delivery process, improve customer experience, and reduce operational hassle for small juice bars and cafes.

2.2 Overall and Specific Objectives

Overall Objective

The overall objective of this project is to design and develop an automated, Bluetooth-controlled robotic delivery system for small juice bars and cafes to improve customer service, reduce waiting time, and promote contactless food delivery.

Specific Objectives

The specific objectives of the project are as follows:

- **Design a Bluetooth-controlled robotic car:** Build a robotic vehicle capable of safely transporting food from the cafe to the customer's location within the park or food court.
- **Integrate an RFID-secured locker system:** Equip the robotic car with a secure, RFID-based locker that opens only when the correct RFID card is scanned, ensuring that only the intended customer can collect the food.
- **Automate the food delivery process:** Enable the cafe to send orders to customers without requiring them to stand in queues or frequently approach the service counter.
- **Minimize human contact and improve hygiene:** Reduce the need for face-to-face interactions, creating a more hygienic and efficient food service system, especially important in public spaces.
- **Enhance customer convenience and satisfaction:** Allow customers to enjoy their leisure time without worrying about order collection, improving their overall dining experience.

2.3 Targeted Outputs

- **Bluetooth-controlled robotic car:** A self-designed robotic vehicle that can be controlled wirelessly through Bluetooth communication. This car will be capable of carrying food orders from the juice bar or cafe to customers sitting at different locations in the park or food court. It will be designed for smooth movement over flat surfaces and will be manually driven by the shopkeeper or staff using a mobile app or controller.

- **RFID-based locker system:** The food compartment of the robotic car will include a secure locker system that can only be opened using a valid RFID card. Each customer receives an RFID card when placing an order. This ensures that the delivered food can only be accessed by the intended recipient, providing a personalized and secure delivery experience.

- **Servo motor-controlled gate mechanism:** The locker gate will be operated by a servo motor that opens when the RFID scanner detects a matching RFID card. This automatic opening mechanism will prevent unauthorized access and simplify the food collection process for the customer.

- **Bluetooth communication system:** The movement of the robotic car will be managed via Bluetooth signals from a smartphone or remote controller. This wireless control system allows the shop staff to navigate the robot accurately to the customer's location without physical contact.

- **Return and reset operation:** After the customer collects the food, the shop staff will remotely drive the robotic car back to its base or charging station. The locker will be reset and prepared for the next delivery, ensuring a quick turnaround and efficient service cycle.

- **Prototype demonstrating contactless food delivery:** The complete system will be built as a working prototype to demonstrate how food delivery can be done without direct human interaction, improving hygiene, operational efficiency, and customer satisfaction in small cafes, especially in open public spaces.

2.4 Direct and Indirect Beneficiaries

- **Direct Beneficiaries:**
  - **Juice bars and cafe owners:** They will benefit from a more efficient delivery process, reducing the workload of staff and improving service quality.
  - **Customers:** Customers will enjoy a convenient, contactless, and hygienic way of receiving their orders while relaxing anywhere in the park or food court.
  - **Shop staff:** Staff will have reduced physical strain from repeatedly delivering orders, allowing them to focus on preparing food and managing other essential tasks.

- **Indirect Beneficiaries:**

- **Park and food court management:** By reducing crowding and improving customer experience, the overall environment of the park or food court will become more organized and attractive to visitors.
- **Technology students and developers:** This project will serve as a learning model for students and hobbyists interested in robotics, automation, and IoT-based delivery systems.
- **Broader public health sector:** Contactless delivery solutions like this can contribute to better hygiene and reduced human interaction in public spaces, promoting safer food handling practices.

2.5 Impact and Impact Pathways

Impact: The project will create an innovative solution for small cafes and juice bars to provide efficient, contactless food delivery within parks and food courts. By automating food delivery using Bluetooth-controlled robots and RFID-secured lockers, the project will reduce customer waiting time, minimize human contact during transactions, and improve overall hygiene standards. This system can serve as a stepping stone toward smart food service solutions in public spaces, enhancing both customer satisfaction and business efficiency. [h]

Impact Pathways:

- **Operational Efficiency:** Small juice bars and cafes will streamline their food delivery process, saving time and labor while ensuring orders reach customers more quickly and accurately.
- **Customer Experience:** Customers will enjoy a more relaxing and enjoyable experience as they no longer need to wait near the counter. Contactless delivery also increases convenience and safety.
- **Health and Safety:** The contactless system minimizes physical interaction, supporting public health guidelines and improving hygiene in shared public spaces.
- **Technology Adoption:** This project encourages small businesses to adopt automation and smart technologies, paving the way for broader digital transformation in small-scale food services.
- **Educational Impact:** The project serves as a learning platform for engineering students and tech enthusiasts, demonstrating practical applications of Bluetooth control, RFID systems, and robotics.

SECTION C: OPERATIONS

3.1 Methodology of Project Implementation

The project will be implemented in several structured phases to ensure systematic development and testing of the robotic delivery system. The major steps are outlined below:

- **Requirement Analysis:** The project team will identify the key requirements for the Bluetooth-controlled car and RFID locker system. This will include selecting appropriate components such as microcontrollers, Bluetooth modules, RFID readers, servo motors, and the necessary mechanical framework.
- **System Design:** The overall system architecture will be designed, covering the car's chassis, motor control, locker system, and Bluetooth communication setup. Circuit diagrams and mechanical layouts will be prepared.
- **Component Procurement:** Required electronic and mechanical components will be sourced from the market according to the specifications outlined during the design phase.
- **Assembly and Integration:** The robotic car and RFID locker system will be assembled. The electronic circuits will be connected, and the servo-controlled locker mechanism will be integrated with the RFID scanner.
- **Testing and Troubleshooting:** The system will undergo rigorous testing to ensure reliable Bluetooth control, correct RFID-based access, and smooth operation of the delivery process. Any detected issues will be troubleshot and resolved.
- **Final Deployment:** After successful testing, the project will be demonstrated as a prototype that mimics real-world operation in a park or food court scenario, showing how the system can be used to deliver food items securely and efficiently.

3.2 Components List and Circuit Diagram

The following components will be used to implement the Bluetooth-controlled robotic car and the RFID locker system:

- **ESP32:** Microcontroller used to control the motors, RFID system, Bluetooth communication, and servo motor operations.
- **Lithium-Ion Battery:** Rechargeable battery to power the entire system.
- **Battery Cell Holder:** Holds and connects multiple battery cells safely and securely.
- **Veroboard:** Used for mounting and connecting the electronic components in a compact and organized way.
- **16 GA DC Motors:** High-torque motors used to drive the wheels of the robotic car.

- **Motor Driver Module:** Controls the speed and direction of the DC motors, interfacing between the microcontroller and the motors.
- **RFID Reader:** Reads RFID cards or tags to authenticate and unlock the locker.
- **RFID Cards or Tags:** Used by customers to unlock the robotic locker and collect their food.
- **Servo Motor:** Operates the locker gate, allowing it to open or close upon successful RFID authentication.
- **Wheels:** Attached to the motors to allow smooth movement of the robotic car.
- **Caster Ball Wheel:** Provides stability and balance to the chassis by supporting movement in multiple directions.
- **Wires:** Used to connect all the electronic and electrical components in the circuit.
- **Switches:** Used for manual control functions such as power on/off or resetting the system.

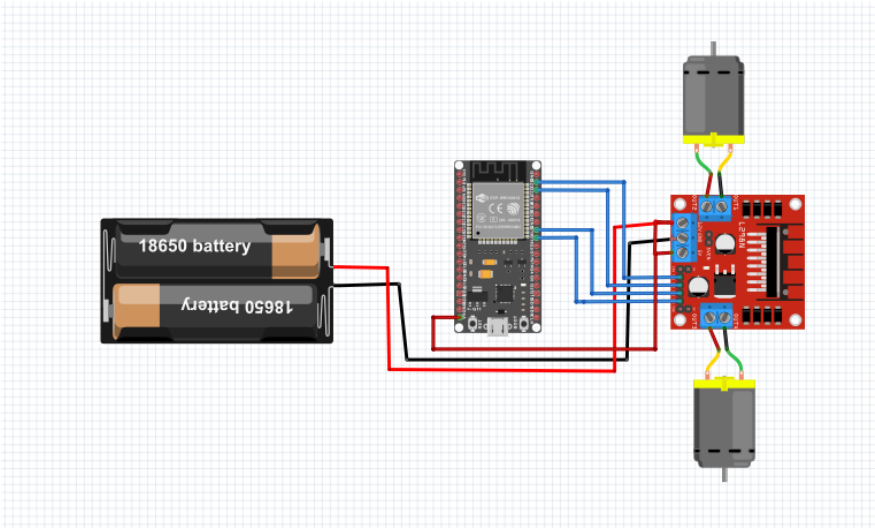

Figure 1: Bluetooth Controlled Car Diagram [1]

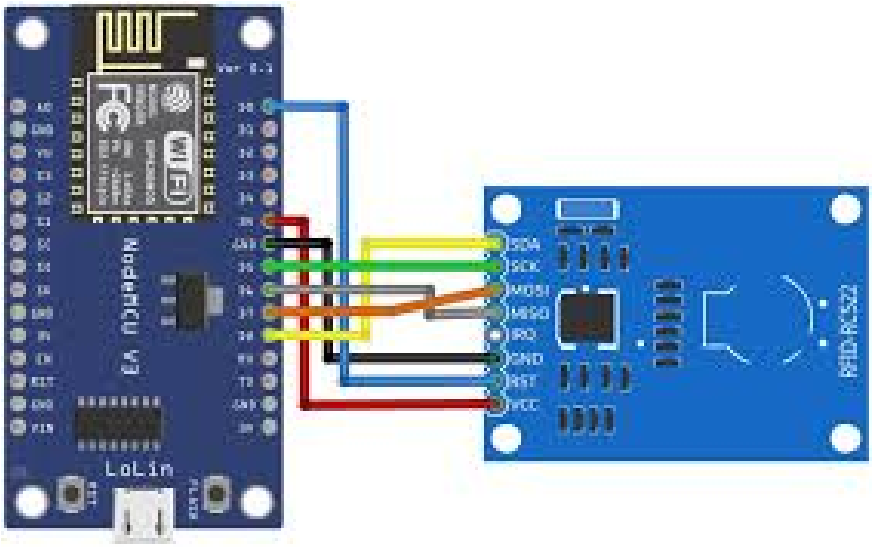

Figure 2: RFID Locker System Diagram [2]

3.3 Project Management Team

Name	Registration Number
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Toma Rani Barmon	2021338036
Md. Asad Shekh	2021338037
Md. Esahak	2021338038

SECTION D: APPENDIXES

Appendix 1: Workplan

Week	Tasks
1	Requirement analysis and finalizing components for the Bluetooth-controlled car and RFID locker system.
2	Procurement of components and materials.
3	Design and development of the robotic car chassis and mechanical assembly.
4	Circuit design and initial hardware setup, including motor driver, servo motor, and RFID module integration.
5	Programming microcontroller for Bluetooth communication and motor control.
6	Development of RFID authentication and servo motor control for locker mechanism.
7	Integration testing of the robotic car movement and RFID locker system; troubleshooting and debugging.
8	Final testing, demonstration, documentation, and project report preparation.

Appendix 2: Budget

Budget Estimation

Component	Cost (BDT)
ESP32 Microcontroller	500
Li-ion Battery Cells	500
Battery Cell Holder	50
Veroboard	200
16 GA DC Motors (2 pcs)	1400
Motor Driver Module	200
RC522 RFID Module	200
Servo Motor	150
Wheels (2 pcs)	200
Ball Caster Wheel	100
Wires and Miscellaneous Components	800
Total Estimated Cost	**4300**

CONCLUSION

This project proposes an innovative approach to automating food delivery in small juice bars and cafes through the use of a Bluetooth-controlled robotic car and an RFID-based locker system. By combining wireless control and secure access technology, the system aims to provide customers with a contactless and efficient way to receive their orders, enhancing the overall service experience in public spaces such as parks and food courts. Although this prototype focuses on the robotic car and RFID locker mechanism, the concept demonstrates how simple automation can reduce manual effort, improve hygiene, and introduce modern technology in small-scale businesses. With further development and integration, this system has the potential to contribute to the growing trend of smart service solutions in the food and beverage industry.

References

[1] Arduino Forum. Using esp-32d wroom to build a car controlled via bluetooth, 2025. Accessed: 2025-07-09.

[2] Circuit Digest. How to make an rfid door lock system using arduino, 2025. Accessed: 2025-07-09.