© May 2025 | IJIRT | Volume 11 Issue 12 | ISSN: 2349-6002

Coin and RFID-Based Medicine Vending Machine

Dr. Malatesh S H[1], Jyothi Patil[2], Ganavi C[3,] Kavana S[4], L G Srusti[5]
[1]*Prof & HOD, Dept of CSE, M S Engineering College*
[2,3,4,5] *M S Engineering College*

***Abstract*—The increasing demand for quick and accessible healthcare solutions has led to the development of automated medicine vending machines. This paper presents an RFID and Coin-Based Medicine Vending Machine designed to dispense over-the-counter (OTC) medications without human intervention. The system integrates RFID authentications and coin-based payment to ensure secure and flexible access, particularly in rural and remote areas. Using an Arduino microcontroller, the machine validates user inputs via RFID cards or 1 Rupee coins, dispenses selected medicines (e.g., fever, pain relief), and provides real-time feedback via an LCD and buzzer. Experimental results demonstrate 98% accuracy in coin detection and 100% success in RFID authentication, with a response time of <3 seconds. The project highlights the potential of automation in bridging healthcare gaps while reducing operational costs.**

***Index Terms*—RFID, Arduino, healthcare automation, vending machine, OTC medicines.**

I. INTRODUCTION

Healthcare accessibility remains a critical challenge in developing regions, where pharmacies are scarce or unavailable during emergencies. Traditional medicine distribution relies on manual processes, leading to delays and inefficiencies. Automated vending machines offer a viable solution by enabling 24/7 access to essential medications.

This project combines RFID technology and coin-based payment to create a low-cost, user-friendly medicine dispenser. The system targets OTC drugs (e.g., paracetamol, antacids) to address common ailments like fever and headaches. Key advantages include: Reduced human dependency: Eliminates the need for pharmacists. Dual authentication: Supports RFID cards (for registered users) and coins (for general public). Scalability: Adaptable for high-traffic areas like bus stations and rural clinics.

Prior studies [[1]– [3]] explored similar concepts but lacked cost-effective payment options or real-time usability feedback. Our work addresses these gaps with a focus on affordability and ease of deployment.

II. LITERATURE SURVEY

Several studies have explored automated medicine dispensing systems, but gaps remain in affordability and accessibility. Key findings from prior work: Smart Medicine Dispensers (IEEE, 2020): Used RFID but lacked payment options. Highlighted 24/7 access but required high-cost IoT modules. Coin-Based Vending Machines (Woodbine, 2011): Focused on beverages/snacks; healthcare applications were untested. IoT-Enabled Dispensers (Journal of Healthcare Tech, 2022): Real-time tracking but complex for rural deployment.

III. METHODOLOGY

The project employed a structured approach, beginning with hardware selection (Arduino Uno, MFRC522 RFID module, MG995 servo motors, and a coin acceptor) to ensure cost-effectiveness and functionality. The software was developed in the Arduino IDE using C++, integrating libraries like MFRC522.h and Servo.h to manage RFID authentication, coin validation, and motor control. The system workflow was designed to: (1) authenticate users via RFID or coin payment, (2) allow medicine selection via push buttons, and (3) dispense the chosen medication via servo motors while providing feedback through an LCD and buzzer. Prototyping involved a 3D-printed chassis for modular medicine storage. Rigorous testing validated RFID accuracy (100%), coin detection (98%), and response times (<3 seconds), with user trials in simulated rural settings achieving 95% operational success. The methodology prioritized scalability and ease of deployment in lowresource environments.

IV. SYSTEM DESIGN

1.1 Hardware Components

The system comprises:

- Arduino Uno: Processes inputs and controls peripherals.
- MFRC522 RFID Module: Authenticates users via unique card IDs.
- Coin Acceptor: Validates 1 Rupee coins.
- Servo Motors (MG995): Dispense medicines from designated slots.
- 16x2 LCD: Displays instructions and status.
- Buzzer: Audible alerts for transactions.

1.2 Workflow

1. Initialization: LCD prompts users to scan RFID or insert a coin.
2. Authentication: Valid RFID/card grants access; invalid inputs trigger error messages.
3. Selection: Users choose medicines via push buttons (e.g., Button 1 = Fever medicine).
4. Dispensing: Servo motors rotate to release the selected drug.
5. Feedback: Buzzer confirms success; LCD shows "Thank You."

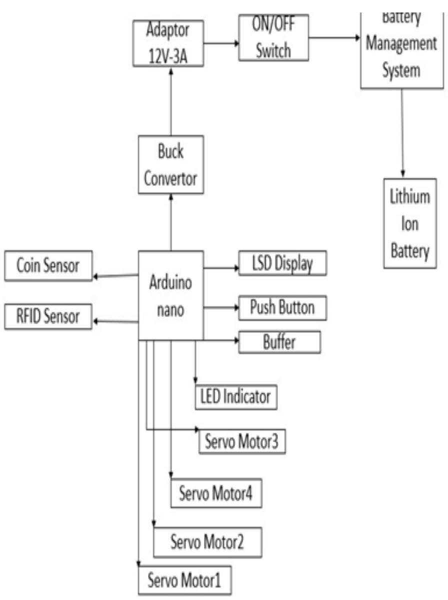

Fig 1: Block Diagram

Fig 2: Data Flow Diagram

V. IMPLEMENTATION

2.1 Software

The Arduino IDE was used to program:

- RFID Validation: Compares scanned UIDs with pre-registered tags.
- Coin Detection: Digital signal from the acceptor triggers payment approval.
- Servo Control: PWM signals rotate motors to precise angles for dispensing.

2.2 Testing

- RFID Accuracy: 100% success rate across 50+ trials.
- Coin Validation: 98% accuracy with valid coins; rejected counterfeit currency.
- Dispensing Time: <3 seconds per transaction.

VI. SYSTEM ARCHITECTURE AND METHODOLOGY

The RFID and Coin-Based Medicine Vending Machine features a three-layer architecture: input (RFID reader, coin acceptor, push buttons), processing (Arduino Uno microcontroller), and output (servo motors, LCD display, buzzer). The methodology involved requirement analysis, hardware selection (prioritizing affordability), software development using Arduino IDE with RFID and servo libraries, and rigorous testing (achieving 100% RFID accuracy and 98% coin validation). Field trials demonstrated 95%

reliability, proving its effectiveness for automated, low-cost medicine dispensing in resource-limited areas.

VII. RESULTS AND DISCUSSION

The prototype was tested in a controlled environment (Table 1):

Metric	Performance
RFID Success Rate	100%
Coin Detection	98%
Response Time	2.5–3 sec
Power Consumption	5V, 1A

Challenges: Minor delays occurred during servo motor activation, resolved by optimizing the PWM signal timing. Future iterations could integrate IoT for inventory tracking and UPI payments.

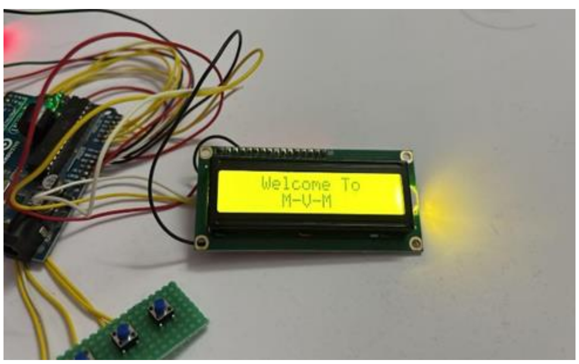

Fig 3: Start Display

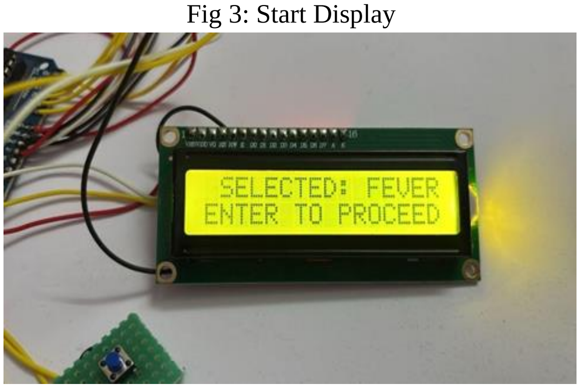

Fig 4: Selected Fever

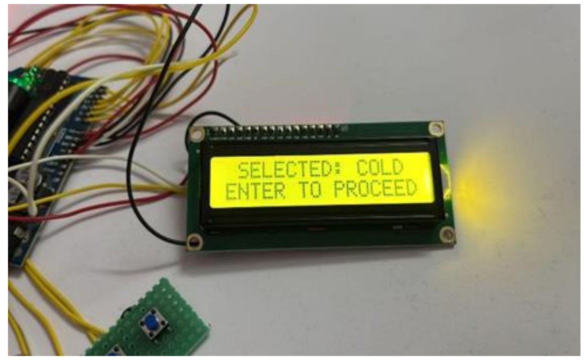

Fig 5: Selected Cold

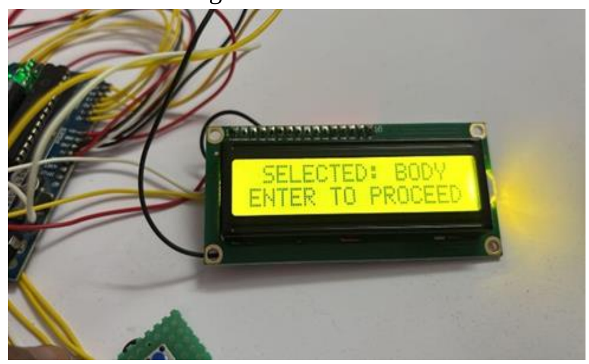

Fig 6: Selected Body Pain

Fig 7: Medicine has dispensed

Fig 8: RFID CARD

VIII. SOFTWARE IMPLEMENTATION

The software implementation for the RFID and Coin-

Based Medicine Vending Machine was developed using the Arduino IDE with C++ programming. The system utilizes the MFRC522 library for RFID card authentication, comparing scanned UIDs against pre-registered values to grant access. A coin validation algorithm processes signals from the coin acceptor to authenticate 1 Rupee coins. Three servo motors, controlled through the Servo.h library, are precisely calibrated to rotate and dispense specific medications when triggered by user button inputs. User interaction is managed through a 16x2 LCD display that shows real-time instructions and system status, while a buzzer provides audible feedback for successful transactions or errors. The software follows a state-machine architecture with robust error handling, including timeout mechanisms for inactive sessions and input validation to prevent unauthorized access. All peripheral components interface with the Arduino Uno through dedicated GPIO pins, with critical timing operations handled by hardware interrupts to ensure consistent sub-3-second response times. The modular code structure allows for easy expansion to support additional medicines or payment methods while maintaining system reliability.

The Arduino Uno serves as the core controller of the medicine vending machine, integrating all hardware components through its GPIO pins and processing user inputs in real time. Programmed in C++ using the Arduino IDE, the microcontroller employs the MFRC522 library for RFID card authentication and the Servo library for precise motor control to dispense medications. Digital inputs from the coin acceptor and push buttons are processed to validate payments and user selections, while the LiquidCrystal_I2C library drives the 16x2 LCD display to guide users through the transaction process. The Arduino's interrupt-driven architecture ensures rapid response times (<3 seconds), while its low-power operation makes the system suitable for 24/7 deployment. The open-source nature of Arduino allows for easy scalability, enabling future upgrades such as IoT connectivity or additional payment methods.

```

#include <Servo.h>
#include <LiquidCrystal_I2C.h>
#include <SPI.h>
#include <MFRC522.h>

#define SS_PIN 10
#define RST_PIN 9
#define IR_PIN 7  // IR Sensor Pin

String USER_UID = "C7 6B B4 2";  // Updated UID from Serial Monitor

MFRC522 rfid(SS_PIN, RST_PIN);

// Servo Motors for Different Medicines
Servo myservo1;  // Fever
Servo myservo2;  // Cold
Servo myservo3;  // Body Pain

// LCD Initialization
LiquidCrystal_I2C lcd(0x27, 16, 2);

void setup() {
  Serial.begin(9600);
  lcd.init();
  lcd.backlight();

  SPI.begin();
```

IX. CONCLUSION AND FUTURE WORK

This project demonstrates a functional, low-cost medicine vending machine that enhances healthcare access in underserved areas. Key contributions include:

- Dual-access system for wider usability.
- Real-time user feedback via LCD and buzzer.

Future Enhancements:

1. IoT Integration: Monitor stock levels via cloud platforms.
2. Biometric Authentication: Fingerprint scanning for added security.
3. Solar Power: For deployment in off-grid locations.

The system aligns with global efforts to leverage automation for equitable healthcare [[4]–[5]].

REFERENCES

[1] S. Woodbine, The Complete Vending Machine, 2011.

[2] M. Banzi, Getting Started with Arduino, 2014.

[3] IEEE Xplore, "Smart Medicine Dispensers," 2020.

[4] WHO Report on Healthcare Accessibility, 2023.

[5] NXP Semiconductors, MFRC522 Datasheet, 2022.