RFID-Based Attendance and Card Management System

This presentation explores an innovative RFID-based attendance and card management system designed for efficient access control and student tracking. Built on a Raspberry Pi platform, the system integrates an MFRC522 RFID reader, a robust database, and user-friendly features to manage and monitor student attendance.

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System Architecture

Hardware Components

- Raspberry Pi
- MFRC522 RFID Reader
- RFID Cards
- LEDs (Red & Green)
- Buzzer

Software Components

- Python
- openpyxl (Excel file handling)
- RPi.GPIO (GPIO control)
- pandas (data handling)
- smtplib & mutt (email functionality)

RFID Card Management

Card Assignment

New RFID cards can be assigned a unique ID and name. The system verifies card uniqueness before assigning. Data is stored securely in a dedicated Excel sheet.

Card Reading

The system reads and verifies registered RFID cards, displaying the assigned ID and name. A green LED and buzzer confirm successful verification.

Card Deletion

Registered card data can be deleted from the system. A red LED and buzzer confirm successful deletion. The Excel sheet maintains an organized record of all cards.

Attendance Tracking and Reporting

Real-time Attendance

The system efficiently tracks student attendance in real-time, marking each student as present or absent, with automatic timestamps for accurate records.

Automated Reporting

At the end of each session, the system automatically generates an updated attendance sheet and sends it via email to the administrator for easy access and analysis.

Data Visualization

The system provides a clear visual representation of attendance data through charts and graphs, allowing for analysis of attendance patterns and trends.

Implementation Details and Error Handling

1 Card Assignment

The system checks for card existence in the database. If new, the user enters the assigned ID and name, and the data is saved in the Excel sheet.

2 Card Reading

The system reads the scanned card and verifies it against the database. If found, it displays the ID and name, with a green LED and buzzer.
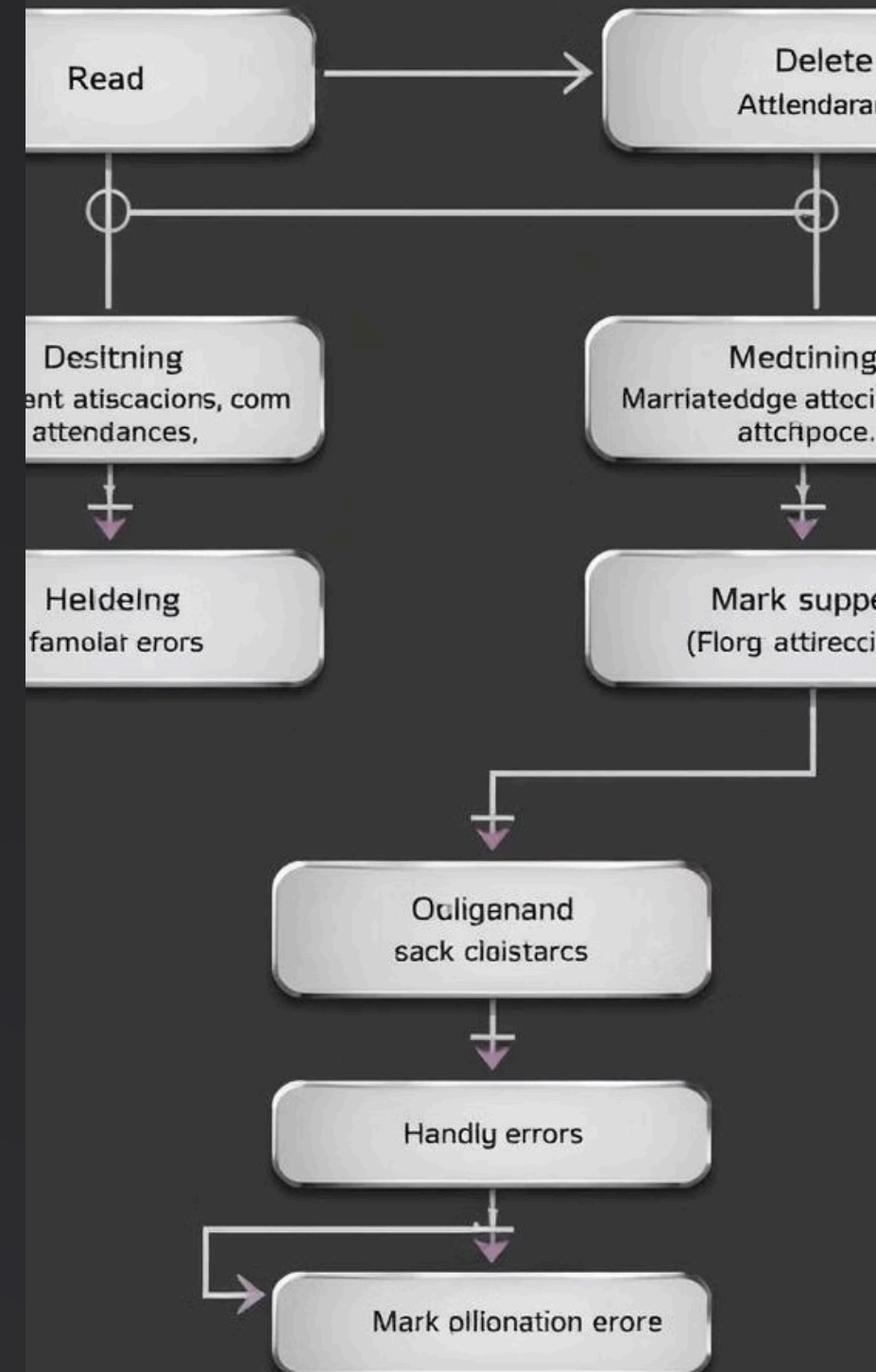
3 Attendance Marking

The system reads the card and marks attendance based on the time: present within 2 minutes, late between 2–4 minutes, or attendance closed after 4 minutes.
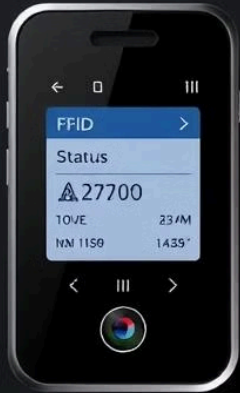
4 Error Handling

The system includes error handling mechanisms such as file corruption detection, input validation, and GPIO cleanup to prevent conflicts and ensure robust operation.

User Interface and Feedback

1 **LED Indicators**

A green LED indicates a successful card read or attendance marking, while a red LED signifies an error or failure.
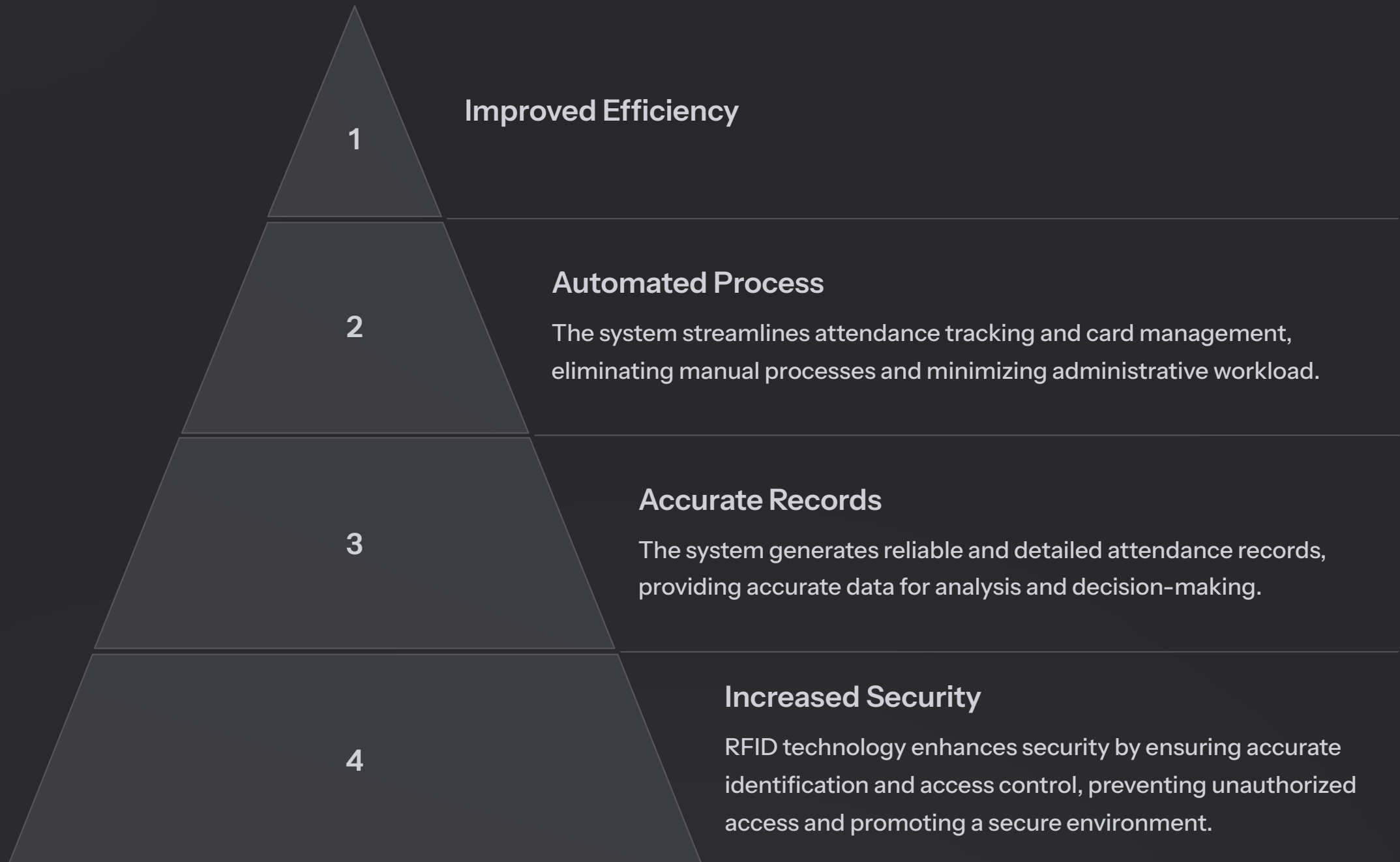
2 **Buzzer Feedback**

A buzzer provides audible feedback, confirming card reads, attendance marking, and error occurrences.

3 **User Interface**

The system provides a simple and intuitive user interface on the connected screen, guiding the user through each step and displaying relevant information.

Benefits and Advantages

1 Improved Efficiency

2 Automated Process

The system streamlines attendance tracking and card management, eliminating manual processes and minimizing administrative workload.

3 Accurate Records

The system generates reliable and detailed attendance records, providing accurate data for analysis and decision-making.

4 Increased Security

RFID technology enhances security by ensuring accurate identification and access control, preventing unauthorized access and promoting a secure environment.

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Conclusion and Future Scope

1

Scalability

The system is easily scalable to accommodate a growing number of users and can be integrated with other management systems for comprehensive data management.

2

Real-time Data

The system provides real-time access to attendance data, allowing for immediate updates and notifications to administrators and students.

3

Enhanced Features

Future enhancements may include integration with other systems, such as online learning platforms, for a more comprehensive and streamlined experience.

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