

Mountable Interactive Safety Storage Unit (MISSU)

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Introduction

This project presents the design and implementation of the Mountable Interactive Safety Storage Unit (MISSU), a removable, secure, and electronically controlled parcel drop-box aimed at reducing failed deliveries, parcel theft, and logistical inefficiencies.

MISSU is a smart, wall-mounted parcel delivery box aimed at reducing missed and stolen parcels in the UK. It integrates keypad security, microcontroller logic, and motor control. Simulated fully in Proteus with embedded C coding. Designed to enhance parcel delivery efficiency and reduce environmental impact. The outcome is expected to improve user satisfaction, reduce environmental impact, and enhance the operational efficiency of delivery services.

With 96 million parcels being delivered every week on average within the UK [1]. According to consumer research conducted by GOPHR [2], from a group of 3000 people they found that 66% of UK adults miss a delivery at least once a month. These missing merchandises cost customers roughly £320 million, with Wales being the most affected within the UK [3].

UK citizens between the year of 2021-2022 this number was around 8 million parcels being lost or stolen. This has seen the largest increase of stolen parcels of 5% compared to previous years, with the Welsh being the most affected [3].

Aims & Objectives

- Design and construct a functional prototype of the MISSU using off-the-shelf electronic components.
- Ensure secure access through keypad entry and electronic locking mechanisms.
- Consider ethical and environmental factors throughout the product's lifecycle, including power usage, material sourcing and user safety.

Design

The Mountable Interactive Safety Storage Unit (MISSU) was developed using a structured Waterfall lifecycle, supported by Agile tools like a Kanban board to track progress. The design focused on modularity and simulation-driven development to ensure reliability and scalability.

Key Components:

PIC16F877A Microcontroller: Controls inputs (keypad), outputs (LCD, motors, buzzer, LEDs).

4x3 Keypad & 16x2 LCD: Provides secure PIN entry and real-time feedback.

Motor Drivers (L293D): Drive motors for mounting, dismounting, and locking mechanisms.

Battery Charging & Protection Circuit: Ensures safe operation and power continuity.

Simulation with Proteus & Code in MikroC:

Enabled thorough system testing before physical build.

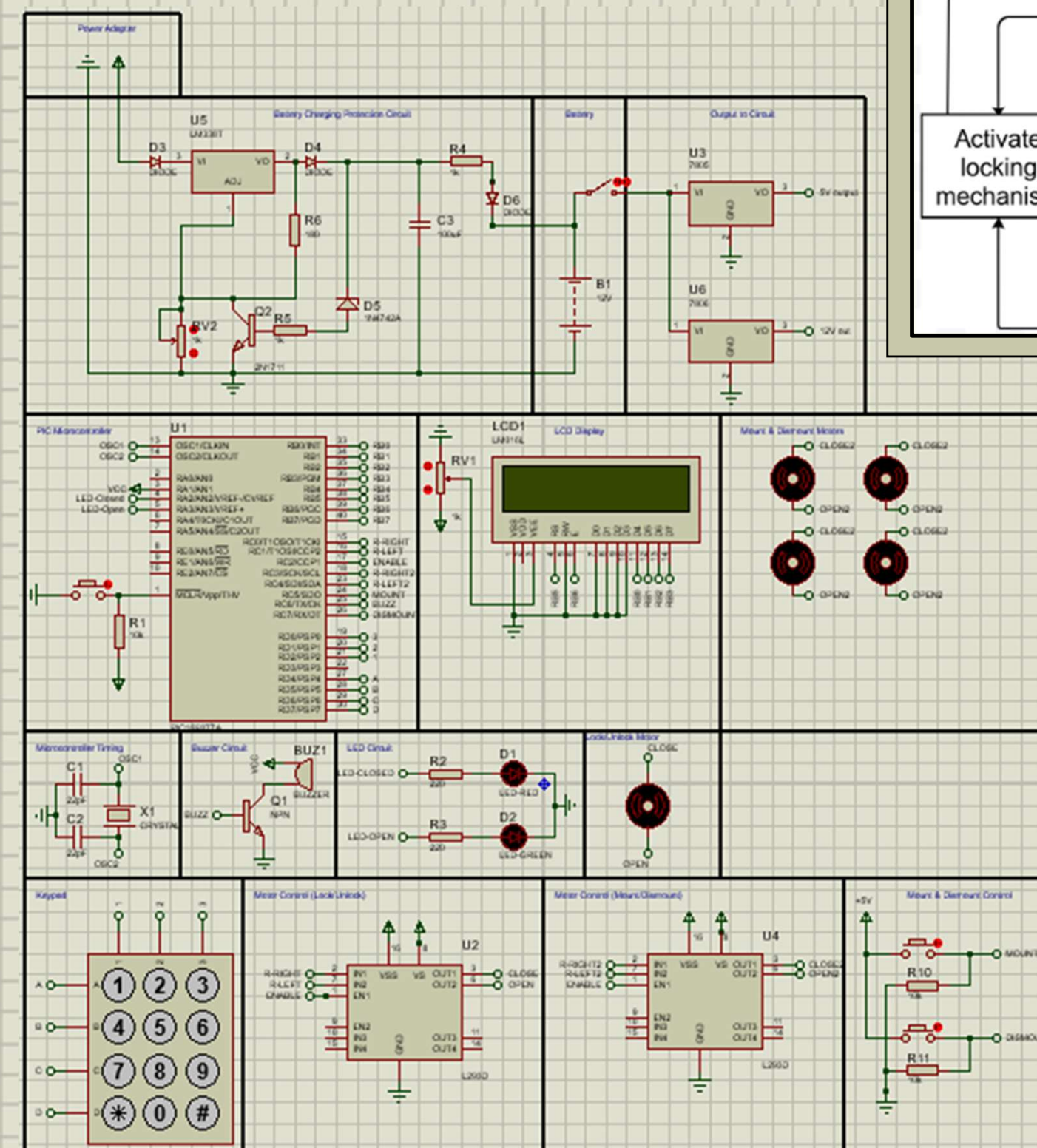
The system was tested in modules, then fully integrated in simulation. While physical assembly wasn't completed, all electronic subsystems were validated virtually to meet performance and functional requirements.

Similar Designs

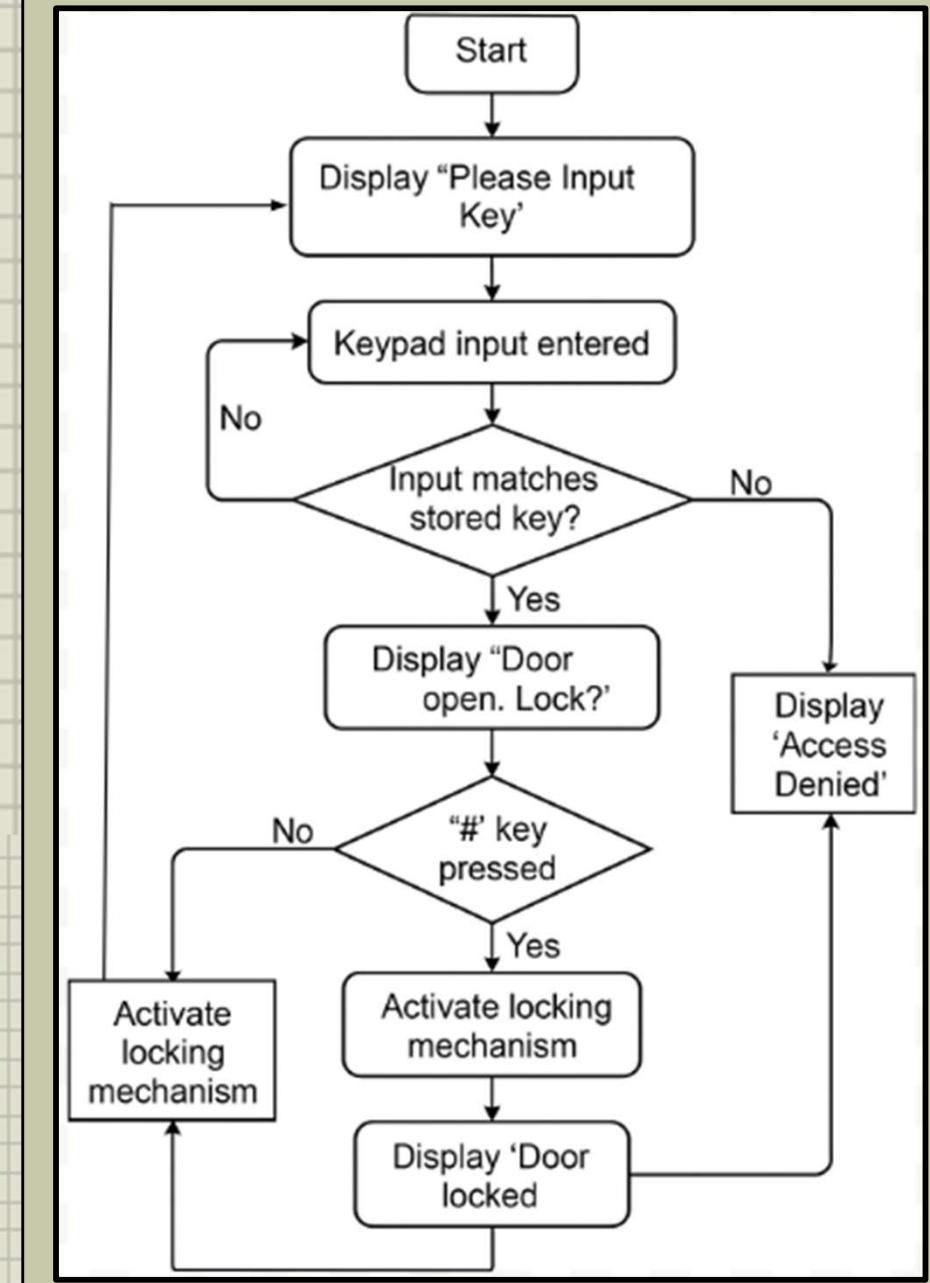
System	Portable	Smart Access	Wall-Mountable	Cost-Effective
Amazon Locker	✗	✓	✗	✗
IoT Smart Box (GSM/Wi-Fi)	✗	✓	✗	✓
Mechanical Drop Box	✓	✓	✓	✓
MISSU (this project)	✓	✓	✓	✓

Conclusion & Next Steps

- MISSU successfully demonstrates a secure, user-friendly solution to reduce missed and stolen parcel deliveries. The system's core features; PIN-controlled access, motorized locking and embedded feedback. Were fully simulated and validated through Protus and MikroC.
- Next steps are to build physical prototype, add user-configurable PIN setup, explore wireless alerts and motion-activated power and sensor detection for locking signals.
- MISSU lays the groundwork for scalable, smart delivery solutions in domestic settings.



Flow Chart



References

- [1] Shiply. UK Delivery and Courier Industry Statistics. [Online] available from: UK Delivery And Courier Industry Statistics - Shiply Accessed on 25/10/2024
- [2] GOPHR. How many people still miss deliveries despite working from home?. [Online] available from: Working at Home: How Many Deliveries Are Missed? | Gophr Accessed on 25/10/2024.
- [3] INDEPENDENT. UK sees 'largest increase' in lost or stolen parcels as 8m go missing in one year. [Online] available from: UK sees largest increase in lost or stolen parcels as 8m go missing in one year | The Independent Accessed on 25/10/2024.