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The Talking Mailbox

2907 Sensors and Actuator Networks

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1 Introduction

1.1 Problem Statement

All Professors and Lecturers have a lot to do and may not always have time to check their mailbox. Imagine how long some letters are left in the mailbox for days just because a professor is busy. On the other hand, checking your mailbox only to find nothing is quite frustrating. What if there was a way that your mailbox could tell you when there is mail? What if you had a talking mailbox?
To solve this problem, we introduce **The Talking Mailbox**. The aim of The Talking Mailbox project is to design and assemble a system that can detect the presence of mail within a mailbox in Building 06 and notify the owner of the mailbox.

1.2 Literature Review

1.3 Project Plan

1.4 System Concept

Functional Requirements

For The Talking Door to be a satisfiable product, the following functional requirements must be implemented:

- It can detect whether or not mail is present within the mailbox.
- It can detect if the mailbox is opened.
- It can check the battery status.
- It can communicate if mail is in the box to a website (based on LoRaWAN).
- It can detect light as a redundancy for confirming the opening status of the mailbox.
- It alerts the responsible person via email or dashboard upon mail detection.
- It sends battery status updates to a website every hour.
- It sends a low battery warning to a website when the battery falls below a defined threshold.

Technical Requirements

For The Talking Door to operate and perform its functions, the following technical requirements must be implemented:

- The weight sensor can detect a change in weight of approximately 20 g. This indicates when a piece of mail has been placed within the box.
- The tilt sensor can detect the rotation of the post box lid. This indicates when the lid is opened.
- The LDR can detect the change in light intensity by a defined threshold. This indicates when the lid is opened.
- The transmitter can reliably connect and communicate via the LoRaWAN Gateway.
- The server with which the LoRaWAN communicates can send emails to relevant personnel about the mail.
- The power supply is a battery with a working voltage of 3.1 V to 5.5 V.
- The enclosure can protect the system within a typical indoor environment (IP 31).
- The system should function at temperatures ranging 0–40°C and humidity 10–90%.

Project Requirements

For The Talking Mailbox project to produce a functional product upon close out, the following project requirements must be met:

- The budget is 100€.
- The project workload is estimated at 100 h.
- The project schedule adheres to the following deadlines:
  - Pitch: 2025-10-21
  - Bill of Materials: 2025-10-23
  - Schematic Design: 2025-11-23
  - Project Implementation: 2025-12-19
  - Project Report: 2026-01-05
  - Project Presentation and Demo: 2026-01-17

2 Theoretical Background

2.1 LoRaWAN

3 Methodology and Design

3.1 Design Approach

3.2 System Design

System Architecture

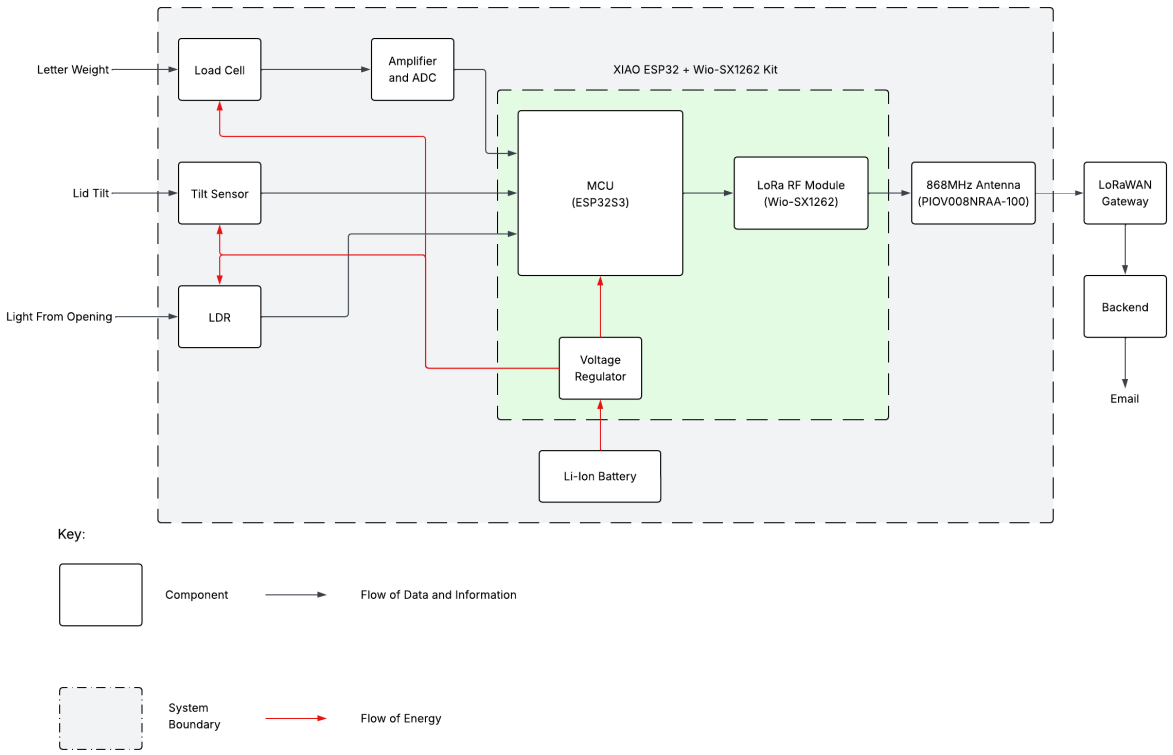

Figure 1: Functional structure diagram of the system architecture

Appendix