Hive Monitor - Light Sensing Concept Overview

1. Overview

This document outlines the light sensing subsystem of the hive monitor project.

The onboard APDS-9960 sensor will be used to monitor ambient light levels, enabling detection of

hive lid removal, unusual light exposure, and possible tampering events.

2. Sensor and Capabilities

- Sensor: APDS-9960

- Interface: I2C

- Measures:

  - Ambient light (lux-level approximation)

  - RGB color values (optional)

  - Proximity and gesture detection (not used for this project)

3. Use Cases

- Detect when the hive lid is removed or opened

- Measure duration of lid-open events

- Detect unexpected daylight exposure (e.g. hive moved, disturbed)

- Correlate light events with motion, sound, or environmental changes

4. Sampling Strategy

- Light levels are sampled every 10 minutes in sync with other sensors

- Optionally monitored more frequently or on interrupt if needed

- Alert condition if light level exceeds a defined threshold

5. Output Format

Each light reading includes:

- Timestamp

- Ambient light level (lux-like units)

- Alert status (e.g., Enclosed, Lid Removed)

Example:

2025-04-10T18:00:00Z | Light: 3 lux | Status: Enclosed

2025-04-10T18:20:00Z | Light: 420 lux | Status: Lid Removed

6. Future Applications

- Correlate light level with bee activity and stress

- Detect seasonal lighting trends or anomalies

- Enable timed logging when light changes occur