

iBot Club Workshop Phase

Task Set 1.3: Integrated Systems

Coordinator Team

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PREREQUISITE

**YOU MUST COMPLETE TASK SET 1.1 AND 1.2 BEFORE
STARTING THIS SET.**

REQUIREMENT

Laptop with Arduino IDE is required.

1 Overview

This set focuses on **Integration**: combining input sensors with output displays/actuators to create interactive systems.

2 Component Locations

- **Arduino, OLED, Buzzer, Buttons, Modules (Laser, LDR, Audio):** Middle Drawer.
- **LCD Display:** Box on the Centre Brown Table.

3 Task 1.3.1: Laser Security System (Tripwire)

Objective

Create a security system that detects when a laser beam is interrupted.

Hardware Required

- Laser Module (Middle Drawer) - *Keep this pointed at the LDR.*
- LDR Module (Middle Drawer)
- Piezo Buzzer (Middle Drawer)
- LCD 16x2 Display (Centre Brown Table)

Instructions

1. Align the Laser Module so it shines directly onto the LDR sensor.
2. Read the LDR value.
 - **High Light Value** = Beam Intact (Safe).

- **Low Light Value** = Beam Broken (Interference).

3. Logic:

- **If Beam Intact:** LCD prints "No Interference". Buzzer is silent.
- **If Beam Broken:** LCD prints "Interference Detected". Buzzer sounds.

4 Task 1.3.2: OLED Grid Walker (Game Logic)

Objective

Implement a "Snake-style" movement mechanic on the OLED display using coordinate geometry and button inputs.

Hardware Required

- OLED Display
- 4x Push Buttons (Up, Down, Left, Right)

Grid Specifications

- The OLED is 128×64 pixels.
- Divide the screen into a grid of 8×8 pixel squares.
- **Player:** A single filled 8×8 square block.

Instructions

1. Initialize the square in the center of the screen.
2. Wire 4 buttons for Up, Down, Left, and Right movement.
3. **Movement Logic:** Pressing a button moves the square by exactly one grid unit (8 pixels) in that direction.
4. **Rollover (Wrap-around):** Implement wall wrapping.
 - If the block moves off the **Right** edge, it must reappear on the **Left** edge.
 - Same logic applies for Left, Top, and Bottom walls.

5 Task 1.3.3: Audio Visualizer

Objective

Visualize sound amplitude on the OLED display in real-time.

Hardware Required

- Audio Sensor Module (White Drawer)
- OLED Display

Instructions

1. Connect the Audio Sensor and read the **Analog** value.
2. **Visualization Logic:**
 - Map the analog audio value to a line height (amplitude).
 - Draw a vertical bar in the center of the screen.
 - The bar should expand up and down from the center horizontal line, creating a "pulsing" effect based on the loudness.
3. **Note:** This is an instantaneous visualization of raw voltage. It is not proportional to the Decibel scale and is not a frequency analysis (FFT).

6 Submission Guidelines

Submit via Google Form:

- **GitHub Link:** Repository with folders for 1.3.1, 1.3.2, and 1.3.3.
- **Drive Link:**
 - Video of the **Laser Tripwire** triggering the buzzer/LCD.
 - Video of the **Grid Walker** moving and wrapping through walls.
 - Video of the **Audio Visualizer** reacting to sound (clapping/speaking).

7 Cleanup (Strictly Enforced)

- Return LCDs to the Centre Table.
- Return Modules to the White Drawer.