Project Review
ME100

Team 100

Project Materials

- ESP32 × 3
  - One for turret sensors (ultrasonic,)
  - One for base motor + laser control
  - One for light-check (photoresistor) and button trigger logic
- DRV8833 Motor Driver
- 12V DC Motor w/ Encoder
- RCWL-1601 UDS (Ultrasonic Distance Sensor)
- Photoresistor (LDR GM5539)
- Laser Pointer (5mW, 650nm)
- Button
  5V Power Supply

Component Functionality

ESP32 (Sensor Unit)
- Reads distance from ultrasonic sensor
- Monitors ambient light with photoresistor
- Sends event triggers to base ESP via ESP-NOW

ESP32 (Base Controller)
- Drives the motor for turret rotation
- Controls the servo aiming the laser
- Handles movement logic based on sensor triggers

ESP32 (Trigger Node)
- Reads button press
- Only enables toy operation if photoresistor detects low ambient light
- Acts as a safety and context-aware activation node

DRV8833 Motor Driver
- Bridges control signals from ESP32 to the DC motor
- Allows directional PWM control for smooth laser motion

Component Functionality

12V DC Motor w/ Encoder
- Drives turret rotation with closed-loop feedback
- Encoder allows precise positioning and randomized redirection

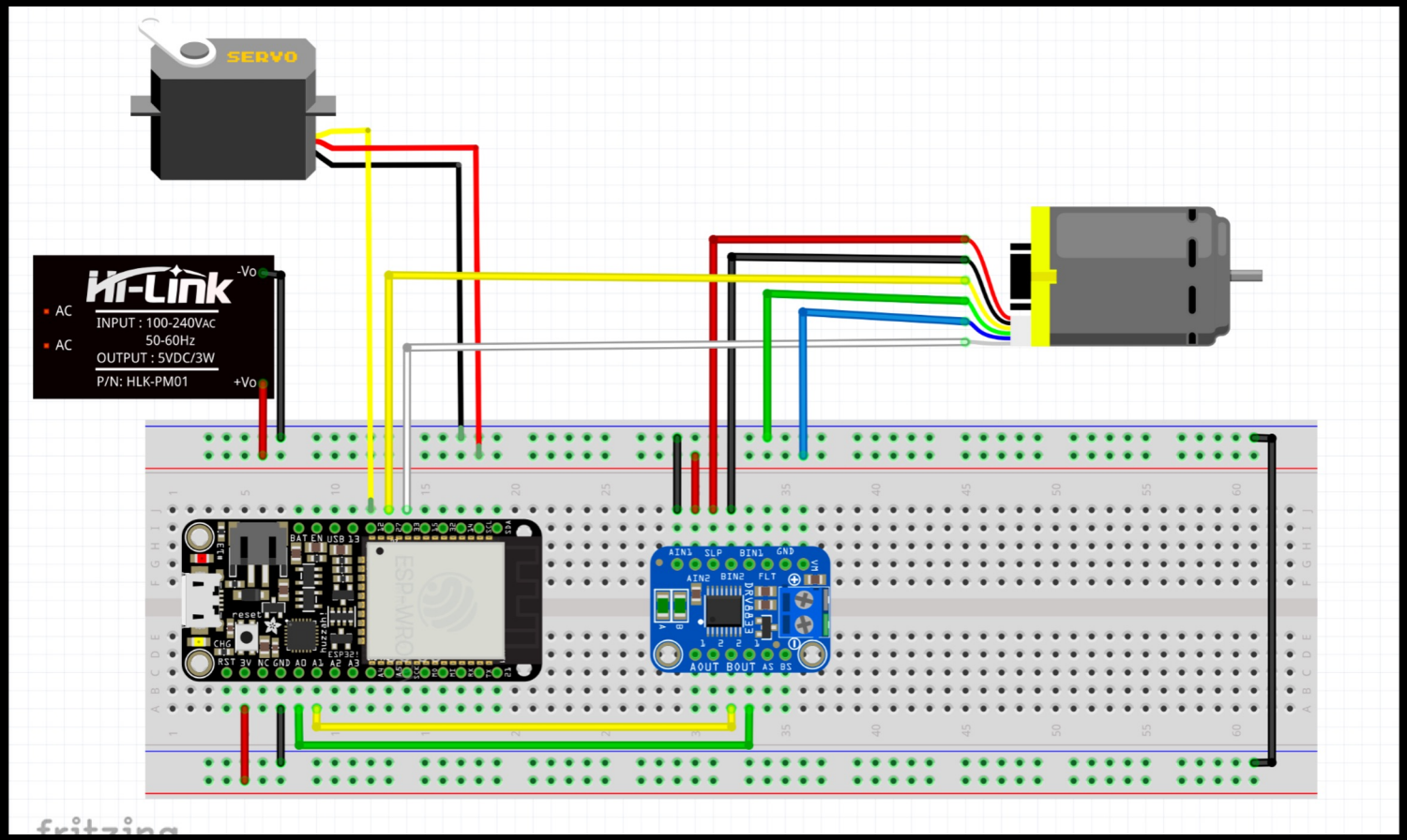
RCWL-1601 UDS (Ultrasonic Sensor)
- Detects when the cat paw approaches
- 2–450 cm range with ~50ms measurement period

Laser Pointer
- Bright, low-power (5mW) red laser (650nm) for cat engagement
- Mounted on servo for directional redirection

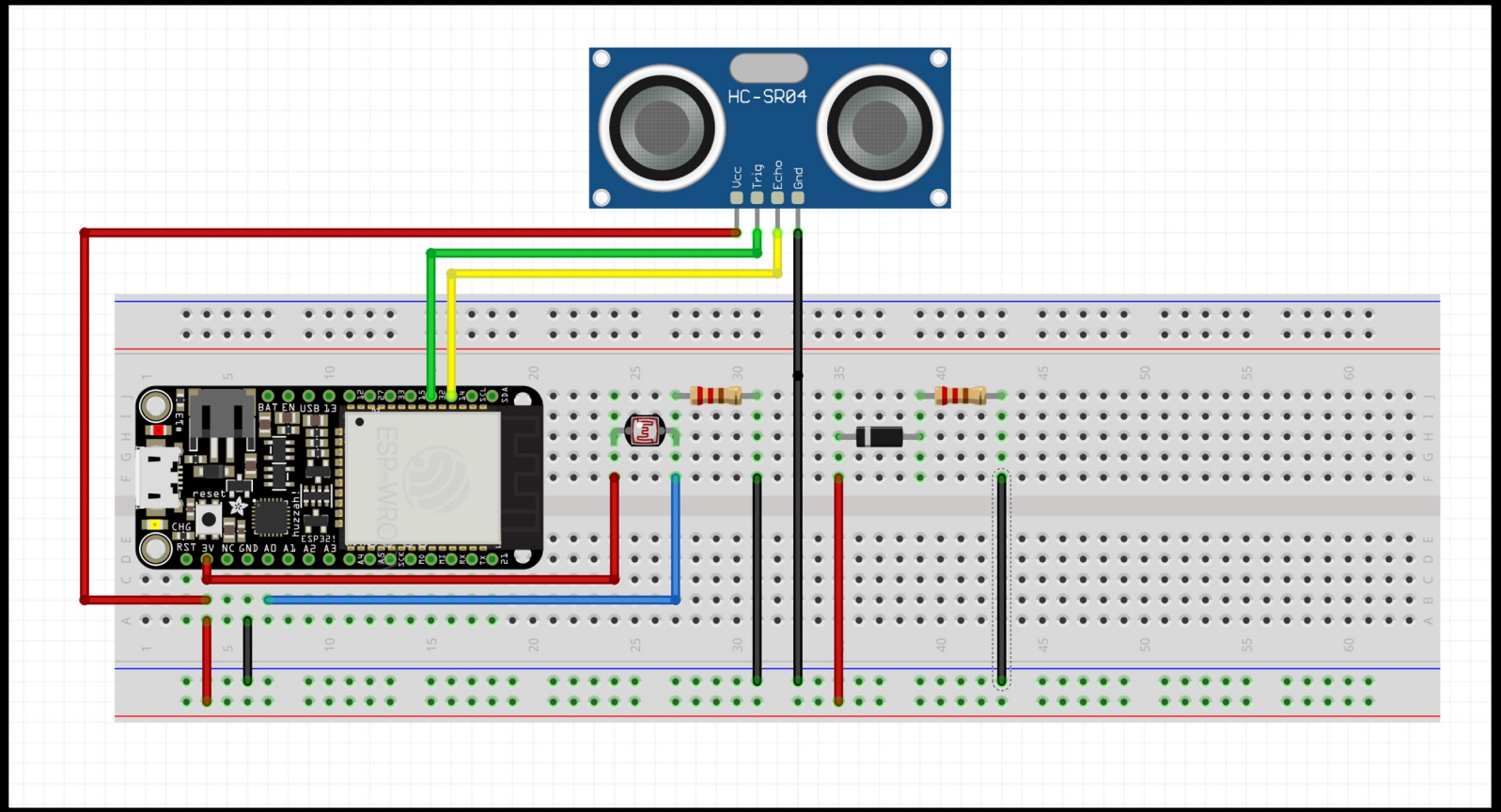
Photoresistor (LDR GM5539)
- Detects ambient lighting conditions
- Prevents toy from activating during bright daylight
- Enables play only in dim lighting (e.g., evening)

Momentary Button
- Manual activation switch for the entire system
- Works in combination with the photoresistor to trigger the play state

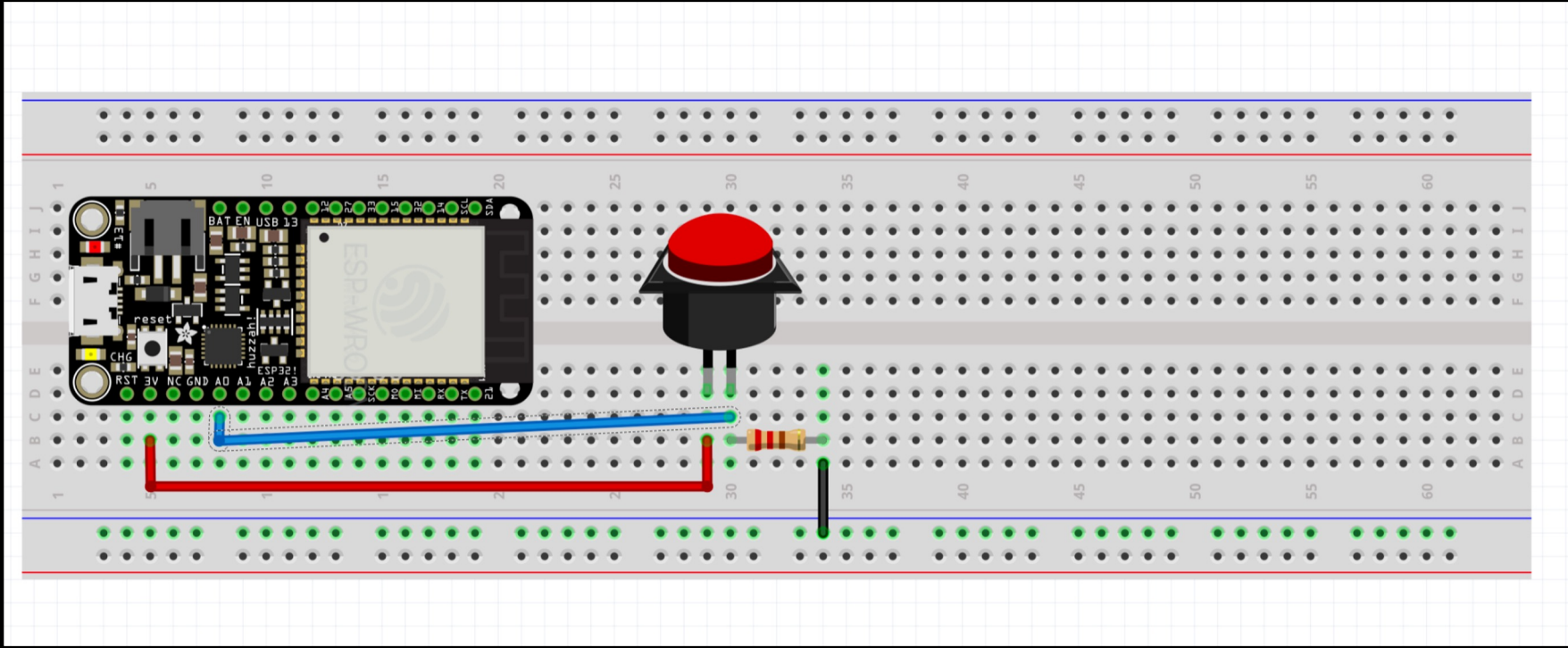
WIRING LAYOUT - BASE



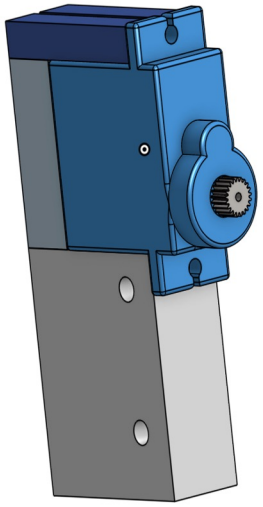
WIRING LAYOUT - SENSOR



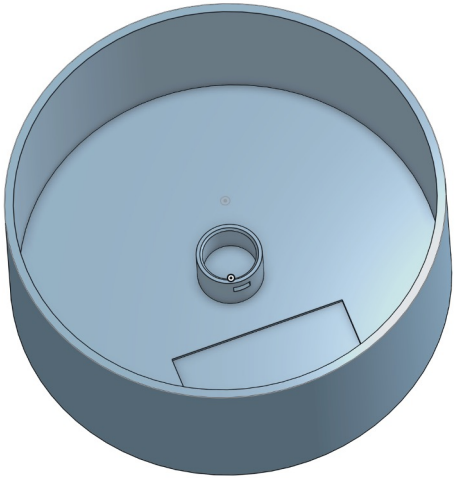
WIRING LAYOUT - TRIGGER



RELEVANT CAD



Servo + Ultrasonic Mount



Cat Toy Base

Cat Toy Lid

IOT CONNECTION

I. ESP32 modules communicate using ESP-NOW:

I. The Sensor ESP32 sends paw detection events to the Base ESP32, which executes laser and motor actions

I. The Trigger ESP32 sends a wake signal to the others only if the photoresistor detects low light and the button is pressed

RELEVANT CODE

All relevant code included in : CODE INFO