Power and Sense Management

Power Source

The main power source for the system is a 2S LiPo battery rated at 8.4V when fully charged. This battery provides the necessary power for all components of the system.

Battery specs:

• Voltage: 7.4V nominal (8.4V fully charged)

• Type: LiPo (Lithium Polymer)

• Configuration: 2 cells in series (2S)

Voltage Regulation

To ensure safe and stable operation, buck converters are used to step down the battery voltage to the required levels for each component.

• 5V Buck Converter: Powers ESP32, sensors, and servo motor that require 5V input.

• 3.3V Buck Converter: Powers components such as IMUs or gyroscopes that require 3.3V input.

Components and Power Supply

- ESP32: This operate at 3.3V. A buck (MP1584) converter is used to step down the battery's 11.1V to 5V to power the microcontroller.
- HC-SR04 Ultrasonic Sensors: Each ultrasonic sensor operates at 5V, so the same buck converter used for the ESP32 also powers these sensors.
- Gyroscope(Mpu9250) : 3.3V from buck converter
- Camera Module (HuskyLens): 5V from buck converter
- Motor Driver: 5V logic, powered from buck converter; motor supply from battery directly if supported
- Servo motor : the servo motor which works at 5 volts is powered by the buck converter

SENSORS

Ultrasonic Sensors (HC-SR04)

There are three HC-SR04 Ultrasonic Sensors mounted on the bot. These sensors are used for obstacle detection and distance measurement.

Power specs:

Operating Voltage: 5V DC

Operating Current: 15mA

Working Frequency: 40 kHz

Sensor roles:

- Front Ultrasonic Sensor: Measures the distance to obstacles directly in front of the bot, preventing frontal collisions.
- Left Ultrasonic Sensor: Measures the distance to obstacles on the left side, ensuring the bot does not veer too close to side barriers.
- Right Ultrasonic Sensor: Measures the distance to obstacles on the right side, preventing collisions from the right.

HUSKYLENS AI CAMERA

HuskyLens is an easy-to-use AI machine vision sensor with 7 built-in functions: face recognition, object tracking, object recognition, line tracking, color recognition, tag recognition and object classification. Through the UART / I2C port, HuskyLens can connect to Arduino and micro:bit to help you make very creative projects without playing with complex algorithms.

Specification

Image Sensor: OV2640 / GC0328

Supply Voltage: 3.3~5.0V

Current Consumption(TYP): 320mA @ 3.3V, 230mA @ 5.0V

Sensor roles :

This has been used to recognize the traffic signal colors and work accordingly. This is trained with two color RED and GREEN. Red obstacle: Indicates that the bot should turn right.Green obstacle: Indicates that the bot should turn left. The camera processes the image and sends signals to the Arduino to determine the appropriate action based on the detected color, guiding the bot to avoid obstacles by making the correct directional turns.

MPU9250 (GYROSENSOR)

Specification

Supply voltage : 3.3V

Built-in logic level converter I2C

Roles : Used for checking and counting turns so that the bot stops after completing three laps and also used in parking as it measures angles.