Final Project Documentation

Developers:
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Goal:
Get a RVR to drive around a room and collect data

Constraints:
A lot of code to write.

Success looks like:
All the code works without error. RVR drives and collects data.

Hardware:
- Sphero RVR (motors and LEDs)
- Raspberry Pi 4 Model B
- HC-SR04 Ultrasonic Sensor
- LEDs (white, green, and yellow)
- OLED display
- Photoresistor (LDR)
- DC Motor (with plastic fan)
- S8050 Transistor
- IN4007 Diode
- Camera
- Speaker
- ADC0832
- Jumper wires (M/M)
- Multiple Resistors (220Ω, 10kΩ, 10Ω)

Using the RVR dual motor system, the RVR will move forward until the ultrasonic sensor detects an object within 30cm of the sensor. At this point, a speaker will beep as an alarm, and the RVR turns 90 degrees to the right and then moves forward again a few seconds later. While the robot is moving, the LEDs will start flashing, the motor and fan will turn on and off, and the OLED display will display the current distance to the wall, and that data will be stored in a CSV file. The Photoresistor will take the current light levels and insert the data and the time that the data was taken into a CSV file. The camera will also periodically take photos and send them to a file.

Software:

Main code

Imports every other code into one and runs them using threading. It uses Ctrl + C to turn them off.

Sphero RVR Movement

Uses a function called drive() to move forward. drive() starts by running the setup program for the ultrasonic sensor, then it will go into a loop that continuously moves forward and turns right 90 degrees. RVR LED turns red when an object is detected, and turns blue when there is no object. The RVRs LEDs are the only light alarm.

Ultrasonic Sensor

The ultrasonic sensor has two main functions, one for setup, called setup(), and one that returns the distance to the nearest obstacle, called distance(). The distance function is used both to display the current distance to the OLED display and to detect when the RVR needs to turn.

OLED Display

The OLED Display uses the distance() function from the Ultrasonic Sensor module to display the current distance to the nearest obstacle. This current distance is stored in a CSV file.

Photoresistor

The Photoresistor takes the current light values and records them onto a CSV file along with the time and date that the data was recorded. It also submits the most recent value to a GUI on the screen of user. The photoresistor uses an ADC0832.

Camera

The Camera will take photos every 10 seconds and submit them to a directory within the project folder.

Motor and Fan

The Motor and Fan will run for 5 seconds and then turn off for another 10 seconds.

LEDs

The LEDs use a function flash_LEDs() Six different LEDs switching turns going on: 2 Yellow, 2 Green, and 2 White

Speaker

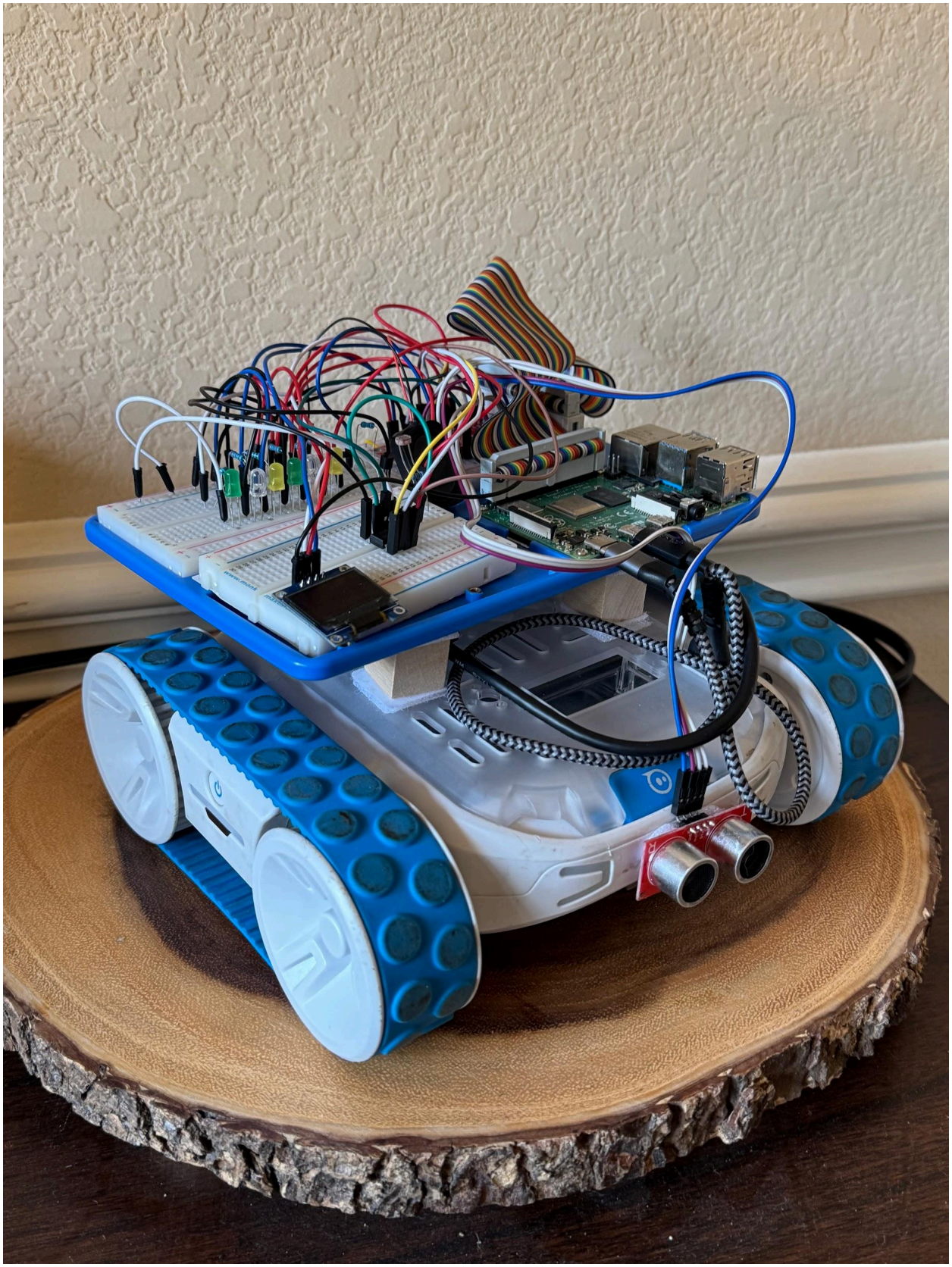
Beeps for 1 second every time an object is detected. The speaker code is imported into the Sphero RVR movement code. The speaker is the only sound alarm.

Integration between RVR and Raspberry Pi:

The Pi runs the code, but the RVR drives the whole thing. LEDs on the RVR change colors. Both motors and LEDs are being used.

Storing of data:

The distance measured from the ultrasonic sensor is being stored in a CSV file. The brightness from the photoresistor is also being stored in a CSV file. The camera takes pictures of the objects it detects and stores them in a directory.



The RVR with all the hardware on it.