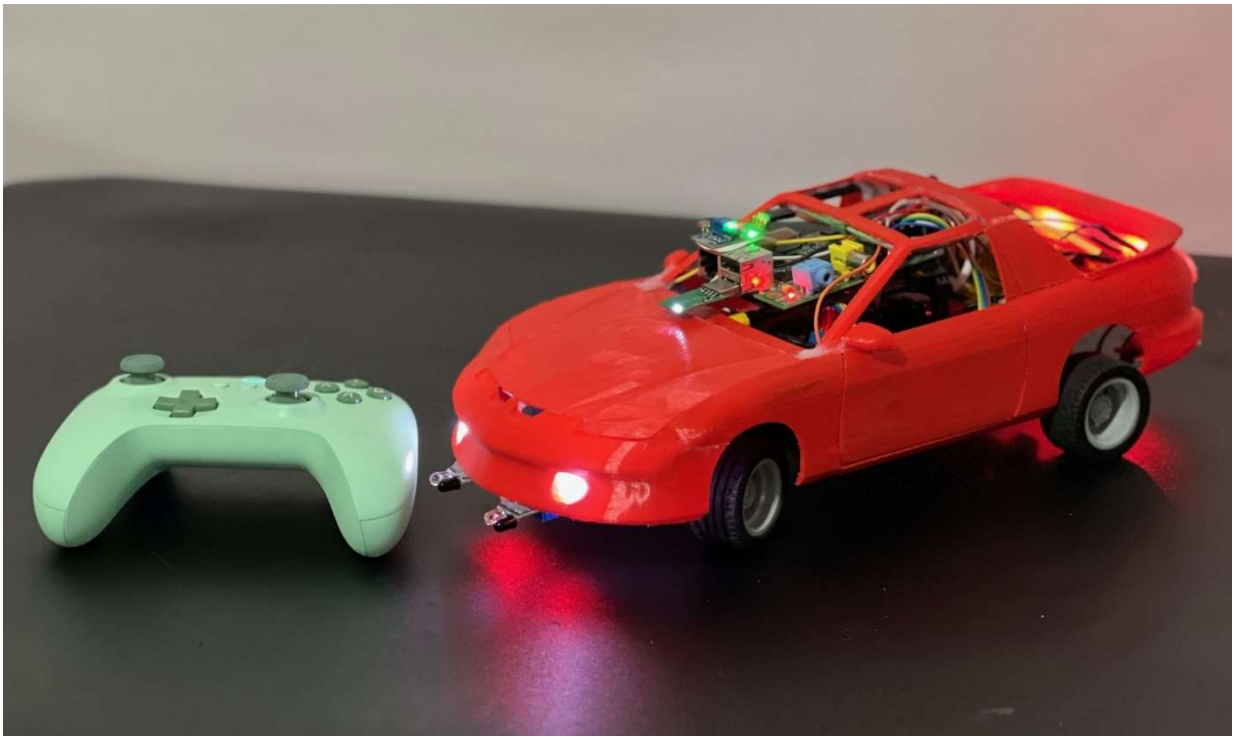
Firebird RC



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Introduction

This project aims to create a wireless RC car using a Raspberry. I created a galvanized steel frame from a scrap computer case for the base of the car, used Lego Technic pieces to create the drivetrain, and Lego motors for driving and steering. All the body panels were 3D printed with red PLA filament, from models that I previously created for other purposes.

The components of the car include: one Raspberry Pi Model 1, one wireless controller with USB dongle, one L298N motor driver, one Lego 71427 9V motor for steering, one Lego 58120 9V motor for driving, four infrared obstacle detection sensors, one light sensor, one switch, one relay, three 3.7V LiPo batteries of capacities: 4000mAh, 4000mAh, and 900mAh, lots of Legos and wires, and one fuse holder with a 15-amp fuse. The 15-amp fuse should be replaced with a much lower amperage since the batteries seem to max out at 4A in a short circuit.

The code is very similar to the code for the original 57 Chevy RC car, with a few changes for the extra sensors and different motors. The code can be viewed at: https://github.com/alexhester/RC-Cars/blob/main/Firebird.py

Some suggestions for a future revision of this project would be to use a microcontroller rather than a full computer like a Raspberry Pi. The Pi has a very long boot time, where a microcontroller would make the car drivable as soon as it is powered. The Pi also has other issues. If it encounters low voltage, it may corrupt the operating system, which will require it to be reinstalled. Another suggestion would be to use much more powerful motors. The Lego motors have relatively low RPMs (~150RPM for the steering motor, and ~900RPM for the drive motor) and low torque. I tried to use gear ratios to increase the speed of the wheels, but then it did not output enough torque to move the car. The car moves slowly with Lego motors, but at least it works. I am already planning another version of this car with much better motors, high output batteries, and a microcontroller like a Teensy 4.0 or Pi Pico. Any microcontroller with USB host capabilities should work.

Demonstration

To start the RC car, just flip the switch on the bottom, and wait until the headlights begin flashing. They can take quite some time to begin flashing, since the Raspberry Pi must boot its entire operating system. Then you can power the controller and it will connect to the Pi and be ready to drive. The controls are very simple:

- Forward = RT
- Reverse = LT
- Steering = Left Analog Stick

Since the cars sensors for obstacle detection are infrared based, they are sensitive to sunlight. Therefore, they must be overridden outdoors.

- Override the obstacle sensor = Hold A
    - Necessary for driving in the sunlight.

You should press these buttons simultaneously to shut down the Raspberry Pi, before flipping the switch to the off position. The lights will flash to indicate that it is shutting down. Watch the Raspberry Pi and notice that the green ACT LED will flash a few times after about ten seconds. This means that the Pi is fully shut down. Now you can flip the power switch off.

- Shutdown = LB + RB + A
    - Wait until Pi is fully off before turning off the car.

You can also override the light sensor if you want to turn the lights on/off on your own. To do this, you should enable the override with D-Pad Left, then you can toggle the headlights with D-Pad Right.

- Toggle override for the light sensor = D-Pad Left
    - Toggle headlights = D-Pad Right