

Smart Garage Parking System

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Abstract

Our smart garage parking system aims to automatically park a car model into a two-space garage. By using sensors, the car model can navigate itself along the driveway and park into the spot. Supporting by the camera, the car model is able to tell whether the parking spaces are empty. More advanced features are also included in the system, such as accident prevention, safety measures and choices of specific parking spot of the two.

Introduction

Demo a car model that can automatically park into a two-space garage. By pressing a button, the user can choose which spot to park when the garage is entirely empty. Otherwise, the car will park into the empty spot if there is a car already inside. The car model will also have safety features.

User manual

On the remote control:

Press button A if you want the car to park into the left space;

Press button B if you want the car to park into the right space.



Notes: If the space you choose is occupied, the car will park into the empty space.

If both spaces are occupied by other cars, the car will stop in front of the garage.

On the driveway, the car will stop if it detects an obstacle, and the car will continue to park when the obstacle is removed.

Car Components

Basic car model: Huanqi professional 734A RC Car

Processing components: ARDUINO MEGA 2560, Raspberry Pi 3

Servo: Futaba S3010 Standard High-Torque BB Servo

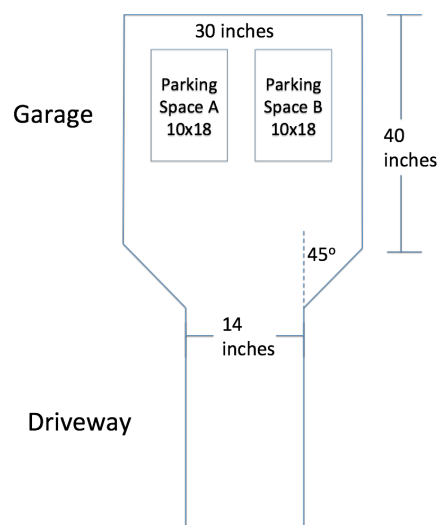
Sensors: HC-SR04 Ultrasonic Sensor

Camera: Raspberry Pi NoIR Camera Module V2 - 8MP 1080P

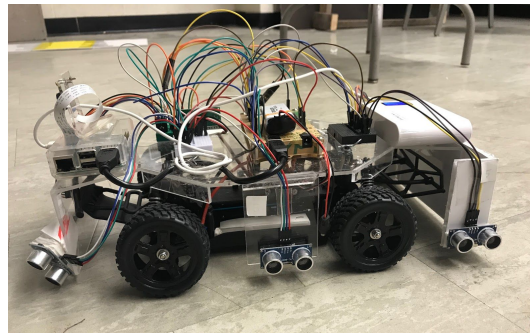
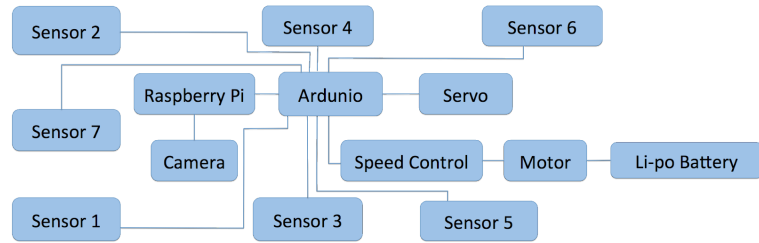
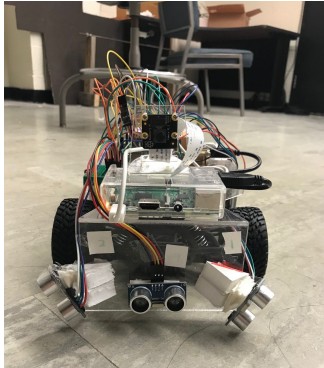
Batteries: Speedpack 2000mAh 7.4V 2S 30C Li-Po Battery, Alkaline 9V Battery (for Arduino),

Portable charger 5V output (for Raspberry Pi)

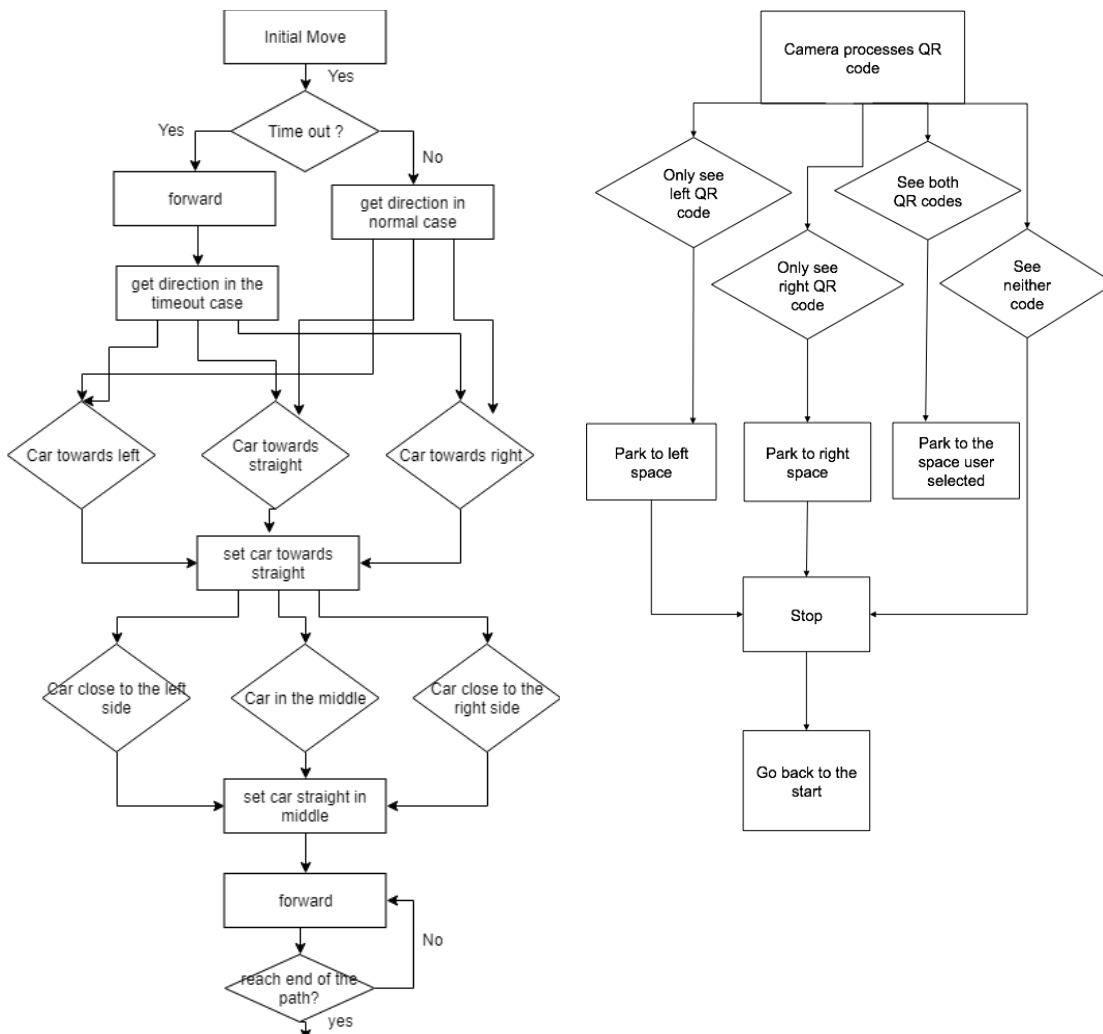
Garage Diagram



Car Diagram



State Diagram



General procedures of the demonstration

Step 1. User presses button A or B.

Step 2. By using ultrasonic sensors, the car will navigate itself along the driveway. If there is an obstacle on the way, the car will not move until the obstacle is moved away.

Step 3. The car will stop at the end of the driveway, and the Raspberry Pi with the camera will read the QR codes on the back wall of the garage.

Step 4. If the garage is fully empty or the user selects the empty space, the car will park into that space. If the user selects the occupied space and the other space is available, the car will part into the empty one no matter which user chooses. If the garage is fully occupied, the car will stop at the end of the driveway.

References

QR code detection and decode in python : <https://github.com/brandelli/Home>