Automated Garage Parking System

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Problem

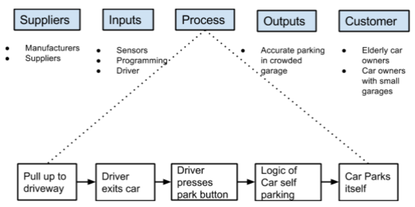
Develop and implement a working model of an automated garage parking system. The system should allow the user to leave their car at the end of their driveway, and park the car consistently in the garage.

Goals

- Consider safety, cost, accuracy, and aesthetics as selection criteria.
- Develop a scaled-down model of the proposed system.
- Develop a plan to scale up to full size system.

Methodology

Define



Measure

- Kano Survey → Minimize Customer Installation
- Cost → Kinect & Magnet Options too Expensive
- FMEA → Ultrasonic Sensor is mission-critical

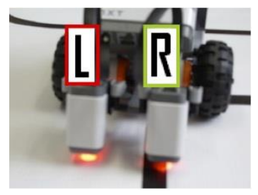
Analyze → 2 Light Sensors + 1 Ultrasonic Sensor is best option.

Design → Logic is translated to Arduino code. 1:10 scale system model is built.

Verify → System capability is verified in test scenarios.

Sensor Options

Ultrasonic
- High-frequency sound waves used to detect proximity of nearest object



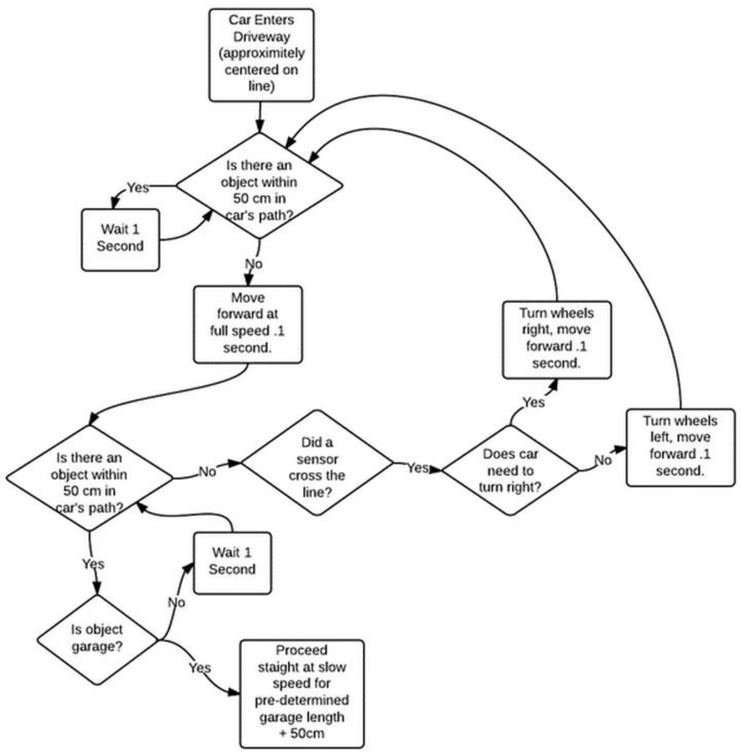
Infrared
- Reflection/absorption of infrared light can be used be used to detect change from black to white.

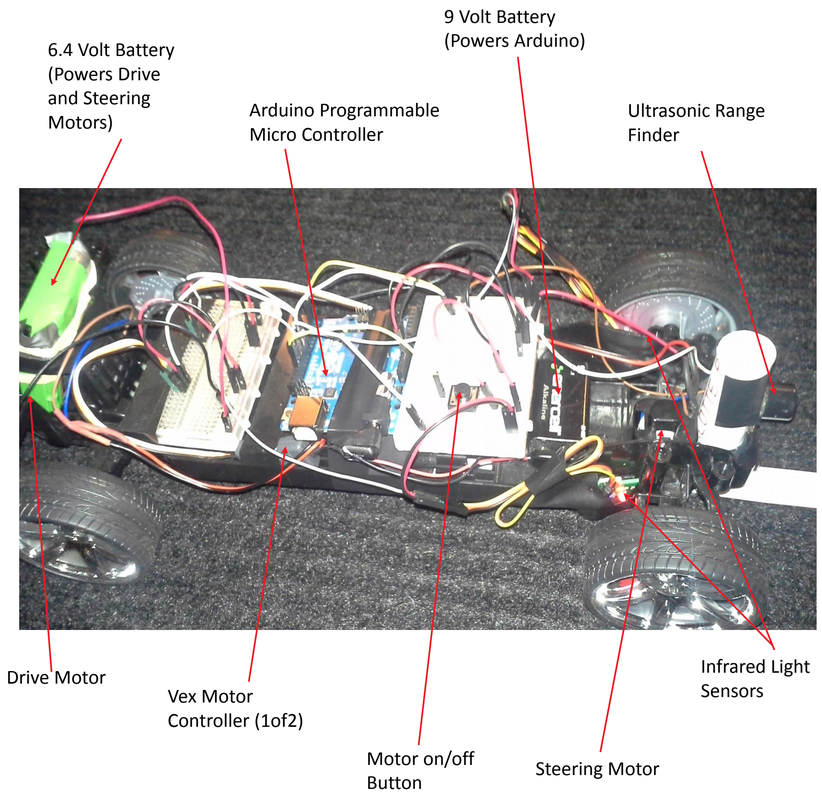
Microsoft Kinect
- Microsoft's open-source object recognition software (Kinect API) can process images to detect positioning.

Magnetic
- Magnetic sensors can detect proximity and orientation using magnetic fields.

Final Design

Infrared Line-Follower With Ultrasonic Proximity Sensor





Moving Forward

While the Infrared/Ultrasonic sensor combination worked well in the 1:10 scale model, the infrared sensors will be difficult to implement in a full-size car, due to the close range required by infrared sensors. An ultrasonic sensor system would be more practical, given more accurate sensors and more robust programming to achieve a reliable and repeatable system.