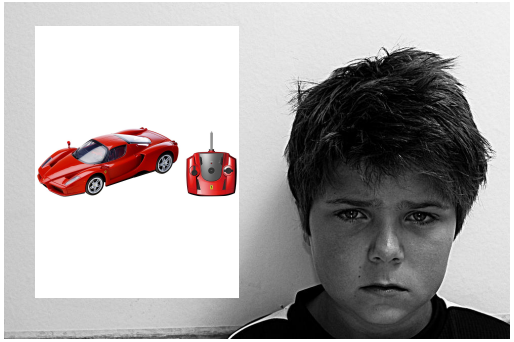
ARio Kart

Sourav Panda
David Yang
Bujji Setty

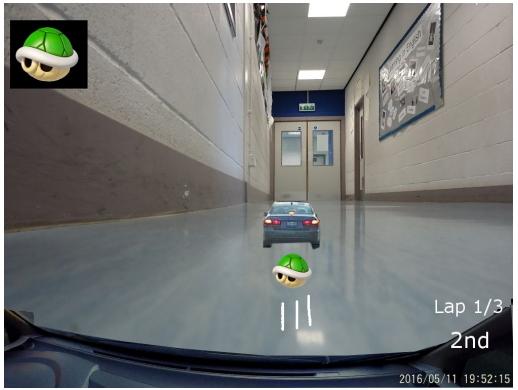
Problem

- Drones
  - Not easily accessible
- Remote Controlled Cars
  - Lifeless, unengaging experience
- Augmented Reality Games
  - Limited to static interactions with background

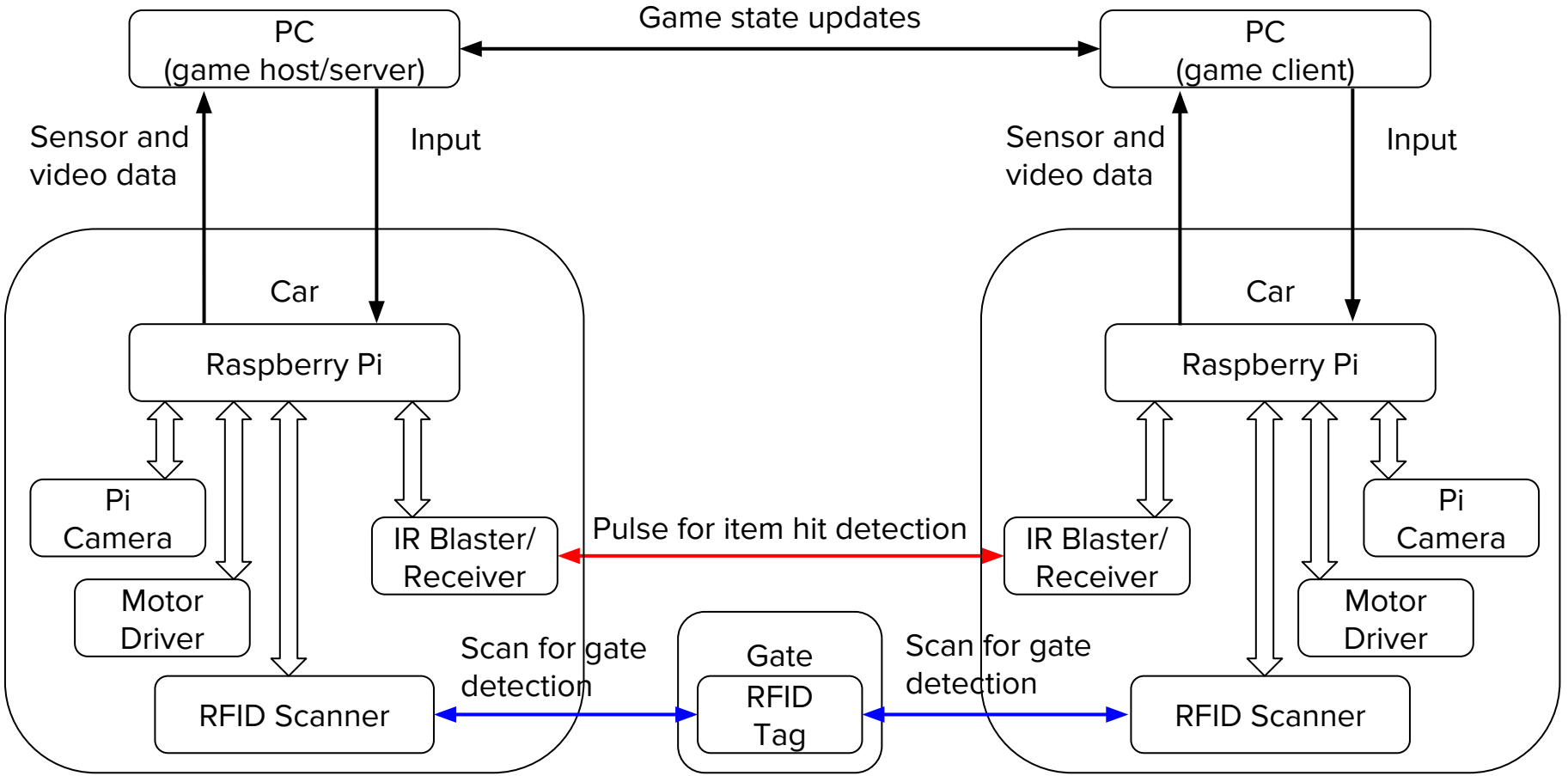


ARio Kart

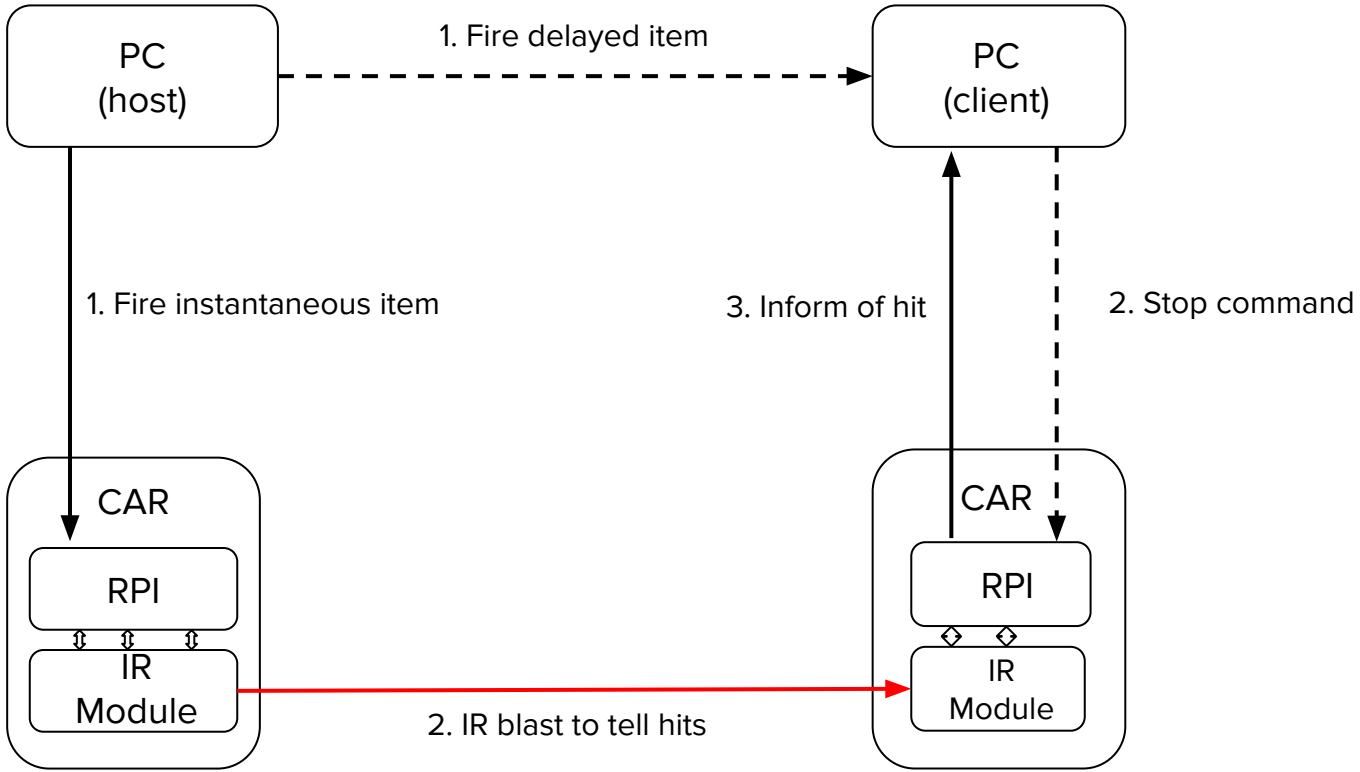
- A slalom-style racing game with physical cars and gates and virtual items
  - Low production cost
  - Extended battery life
  - Lively multiplayer gameplay
  - Dynamic AR



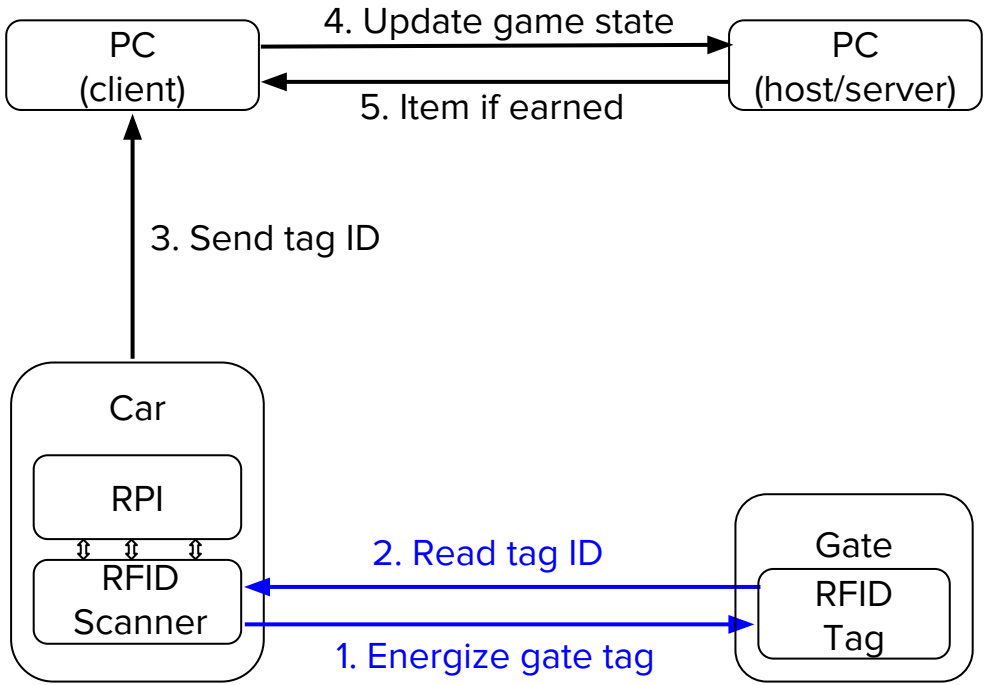
System Architecture



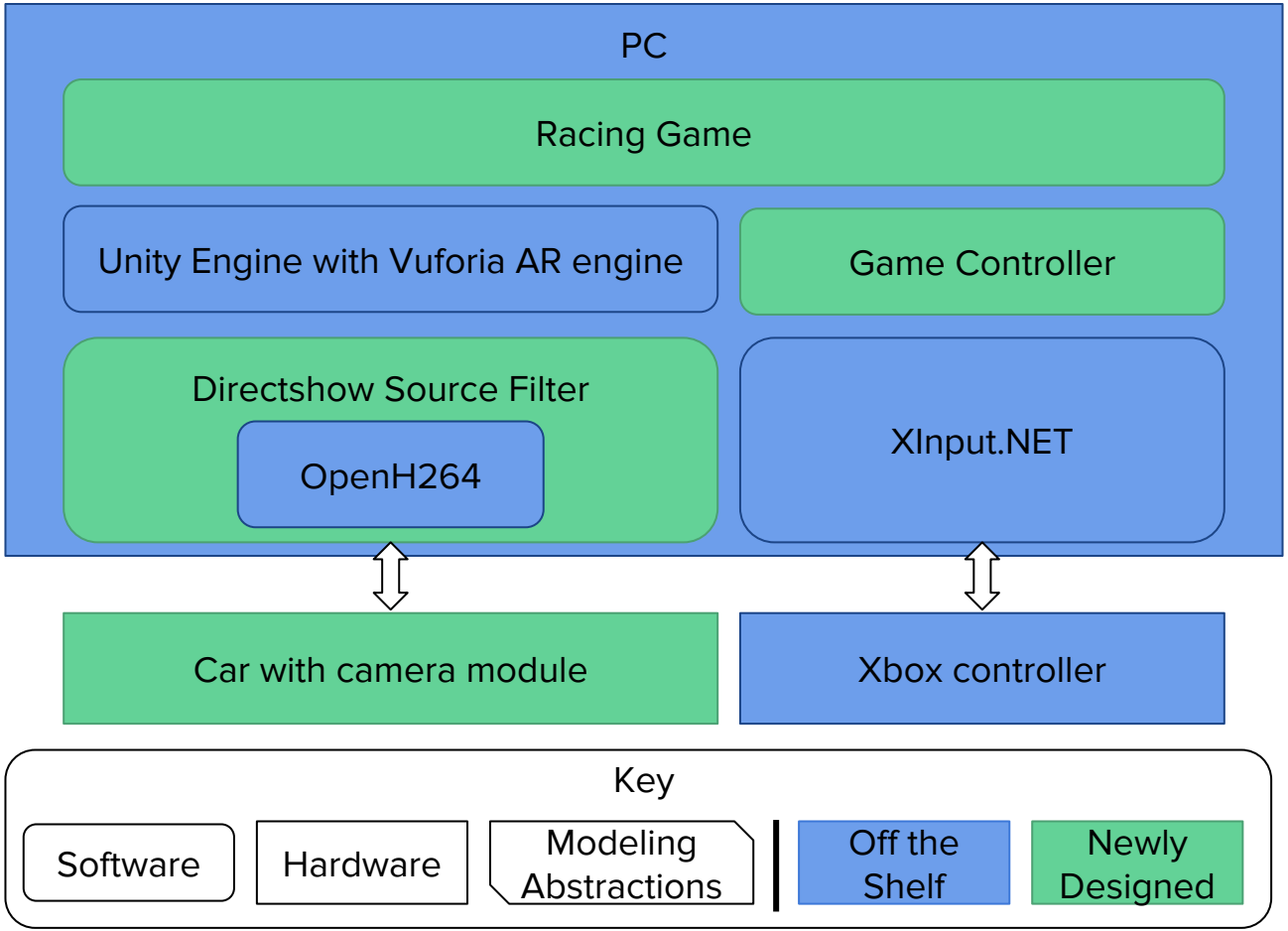
Firing an Item



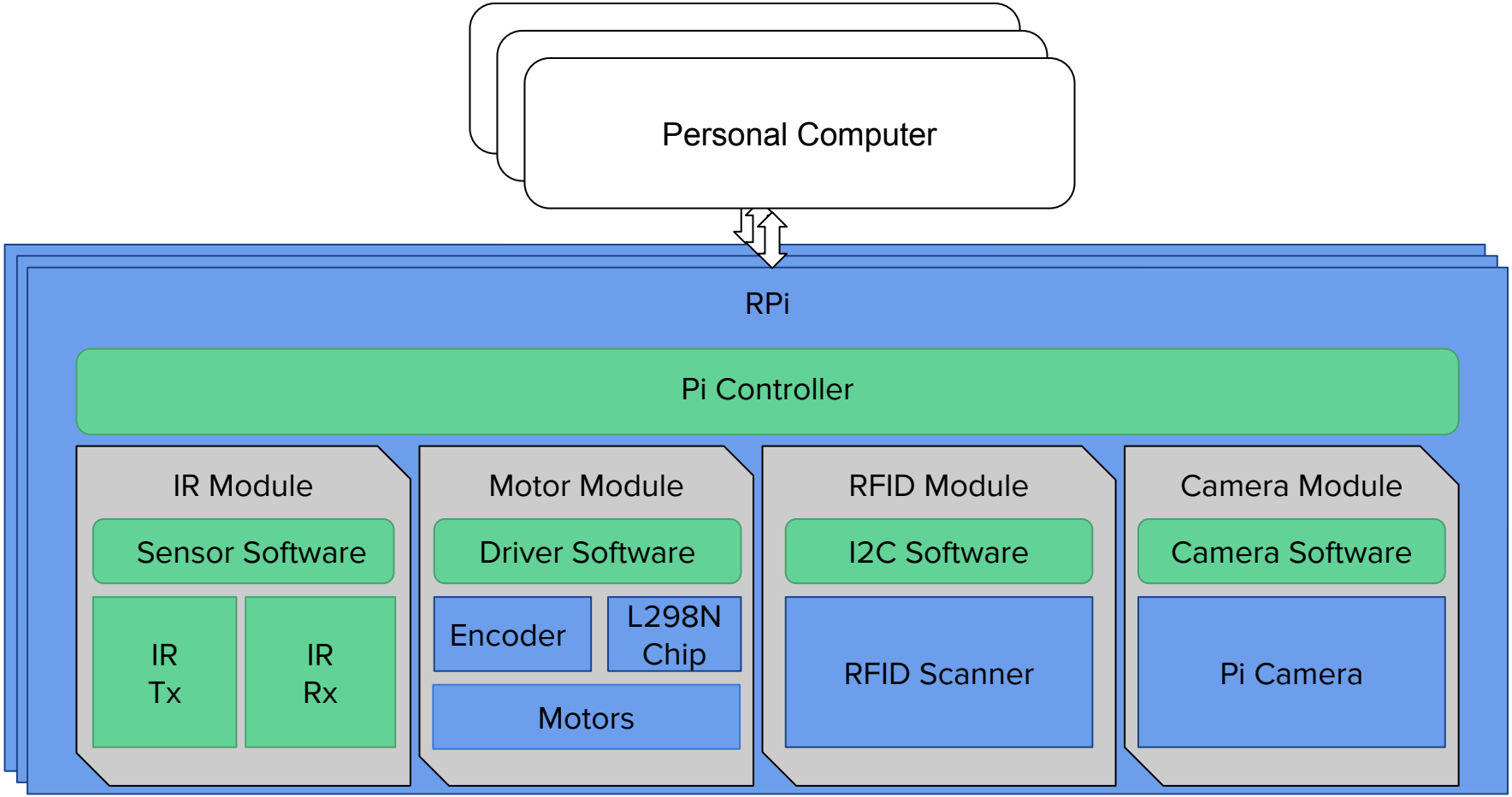
Passing Through a Gate



Game

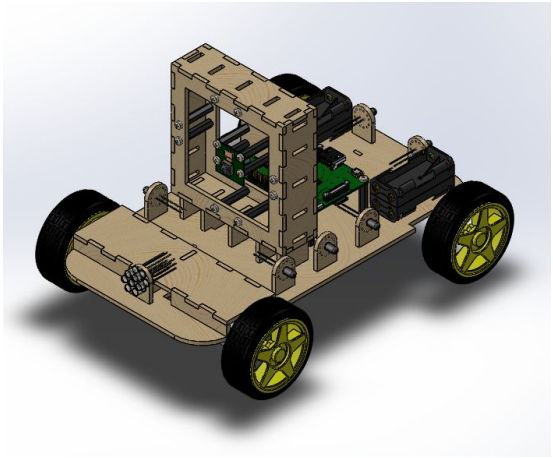

PC
Racing Game
Unity Engine with Vuforia AR engine
Game Controller
Directshow Source Filter
OpenH264
XInput.NET
Car with camera module
Xbox controller
Key
Software
Hardware
Modeling Abstractions
Off the Shelf
Newly Designed

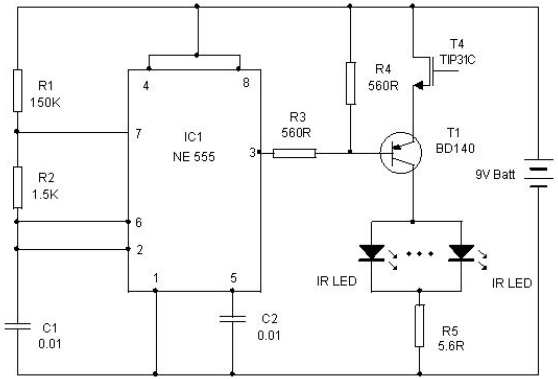
Pi

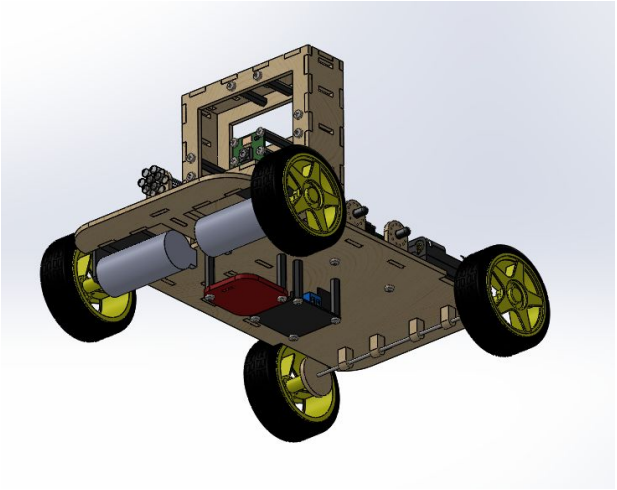

Personal Computer
RPi
Pi Controller
IR Module
Sensor Software
IR Tx
IR Rx
Motor Module
Driver Software
Encoder
L298N Chip
Motors
RFID Module
I2C Software
RFID Scanner
Camera Module
Camera Software
Pi Camera

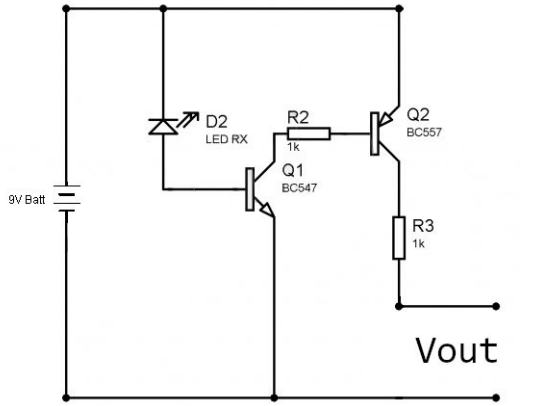
Hardware

- Off the shelf
  - RFID module
  - Motor driver
- Designed
  - IR receiver/transmitter
  - Car layout
  - Suspension of camera









Software Metrics

Function	Requirement	Validation Method
Video Streaming	Latency less than 100ms	Time-stamps
Control/Sensor comms	Latency less than 100ms	Time-stamps
Game Interactions	Able to progress through a race, use three kinds of power-ups	Unit tests
Overlay game HUD	Post-processing remains below 100ms E2E	Time-stamps

Hardware Metrics

Function	Requirement	Validation Method
Motor Speed	Set to desired speeds (± 2 RPM)	Hall-effect encoders
Turn Angles	Turn at desired angle (± 1°)	Entering vs leaving comparison
RFID Detection	Detect passing gate before body crosses	Manual inspection
IR Detection	IR array can detect hit with accuracies - 99% at 2 m - 95% at 5m - 90% at 7m - 85% at 10m	Placeable target with script to pulse

- RISK FACTOR: stabilizing video feed

Management

Tasks	Start Date	End Date	Timeline
Project: ARioKart	02-24-2019	04-21-2019	
Spring Break	03-08-2019	03-16-2019	
Booth	04-06-2019	04-13-2019	
Race HUD and Menus	02-24-2019	03-02-2019	
Matchmaking p2p and p2pi	03-02-2019	03-08-2019	
Video streaming	3-16-2019	03-23-2019	
Race game logic and comms	03-23-2019	03-30-2019	
Xbox Controller/pi control integration	03-30-2019	04-06-2019	
Item use rendering and logic	04-06-2019	04-13-2019	
Pi Control	02-24-2019	03-02-2019	
RFID Driver	03-02-2019	03-08-2019	
IR Driver	03-16-2019	03-23-2019	
Pi Motor Driver	03-23-2019	03-30-2019	
Pi sensor data streaming	03-30-2019	04-06-2019	
Pyshical layout of the PCB	02-24-2019	02-27-2019	
Design power system for the pi and motors	02-27-2019	03-02-2019	
Solder IR ciruit	03-02-2019	03-04-2019	
Build base and assemble parts	03-04-2019	03-08-2019	
Video streaming	03-16-2019	03-23-2019	
Design three models for exterior	03-23-2019	03-30-2019	
Plan out the gates	03-30-2019	04-02-2019	
Fab frame and gates	04-02-2019	04-06-2019	
Full System Integration	4-13-2019	4-21-2019	