Vehicle Object Avoidance Test Platform

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Background

- The global autonomous vehicle market is expected to reach $557 billion USD by 2026 [1]
- Autonomous vehicle failure rates paralleling the aerospace industry (1 catastrophic failure per billion hours) indicates exhaustive testing is required [2]
- Engineers need a test platform that allows for the rapid prototyping and testing of Networked Vehicle Avoidance Algorithms

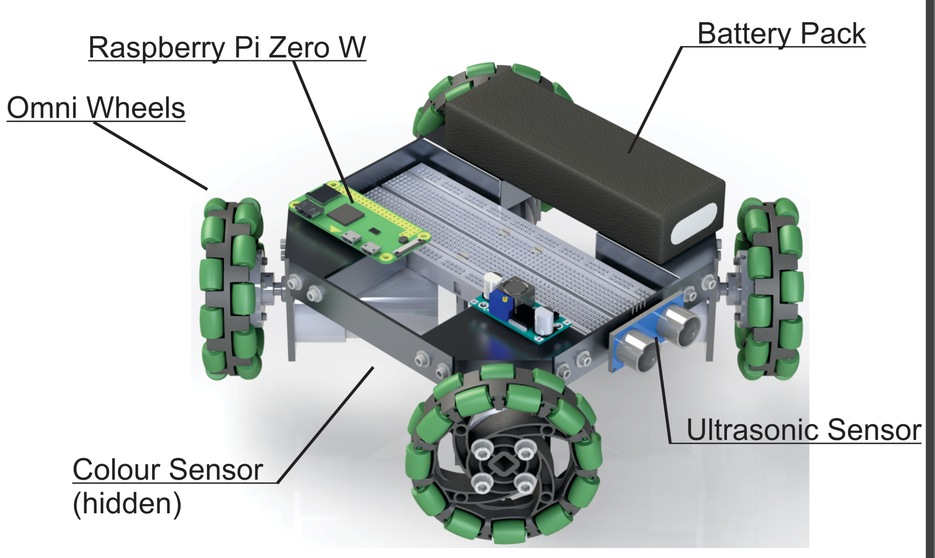
Problem Statement

- Design and build a platform to test object avoidance algorithms, requiring:
  - I. Autonomous vehicles
  - II. Test environment (no active sensing)
- Develop path planning algorithms with visual feedback for lane alignment corrections.
- Develop vehicle collision avoidance algorithms for navigating the intersection via a networked approach

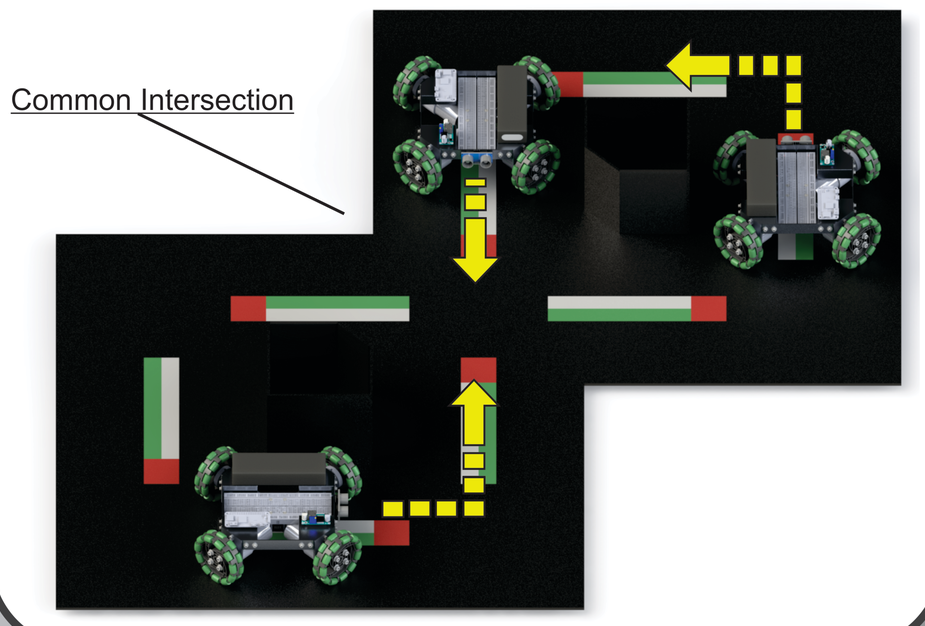
Proposed Solution

Omni-Wheeled Autonomous Vehicles

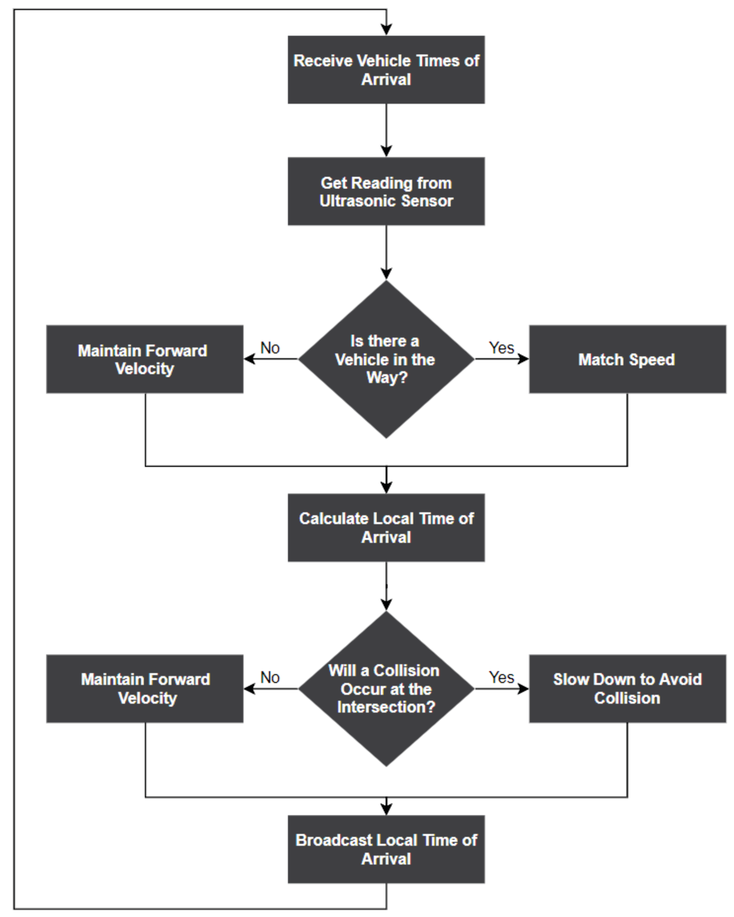
- Forward Collision Sensing (ultrasonic)
- Line Following (white/green colour sensing)
- Bluetooth Communication



Testing Environment



Collision Avoidance



Conclusions

Vehicles communicate expected time of arrival to intersection and adapt speed to avoid collisions.

Future Work: Develop real-world environments, with complex intersections and multi-lane roads. Replace colour sensor with camera for better situational awareness.

[1] R. Kumar, "Autonomous Vehicle Market by Level of Automation (Level 3, Level 4, and Level 5) and Component (Hardware, Software, and Service) and Application (Civil, Robo Taxi, Self-driving Bus, Ride Share, Self-driving Truck, and Ride Hail)," Allied Analytics LLP, 2018.

[2] P. Koopman and M. Wagner, "Challenges in Autonomous Vehicle Testing and Validation," in 2016 SAE World Congress, 2016.

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