Overview of PCAS 1

Software Engineering CSE435

Michigan State University

Fall 2013

Team members:

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Project Overview

The system provides an autonomous vehicle with constand sensors which will detect pedestrians and break the vehicle before a collision can occur.

Motivation for project:

- A desire to reduce the number of collisions with pedestrians.
- To facilitate greater safety in automobiles

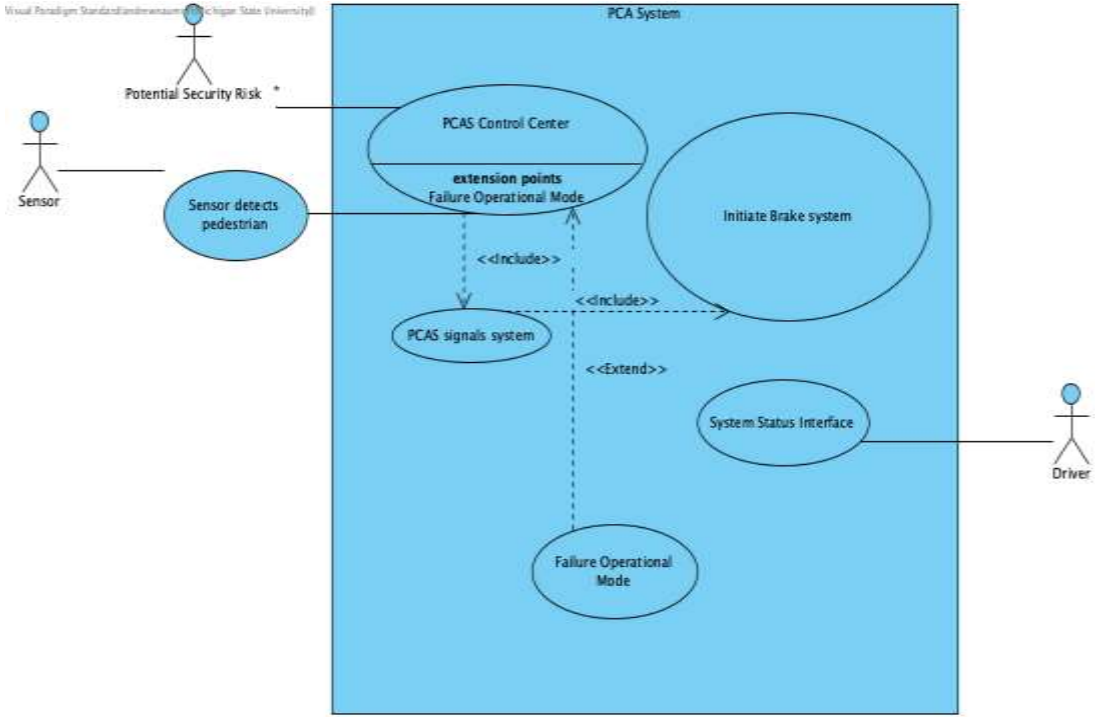
Overview of Features

- Sensors capable of detecting pedestrians
- Brake-by-wire system capable of slowing the acceleration of the vehicle to a stop
- Drive-by-wire system capable of returning vehicle back to a steady state speed.
- Encryption build into the communication between subsystems.

Domain Research

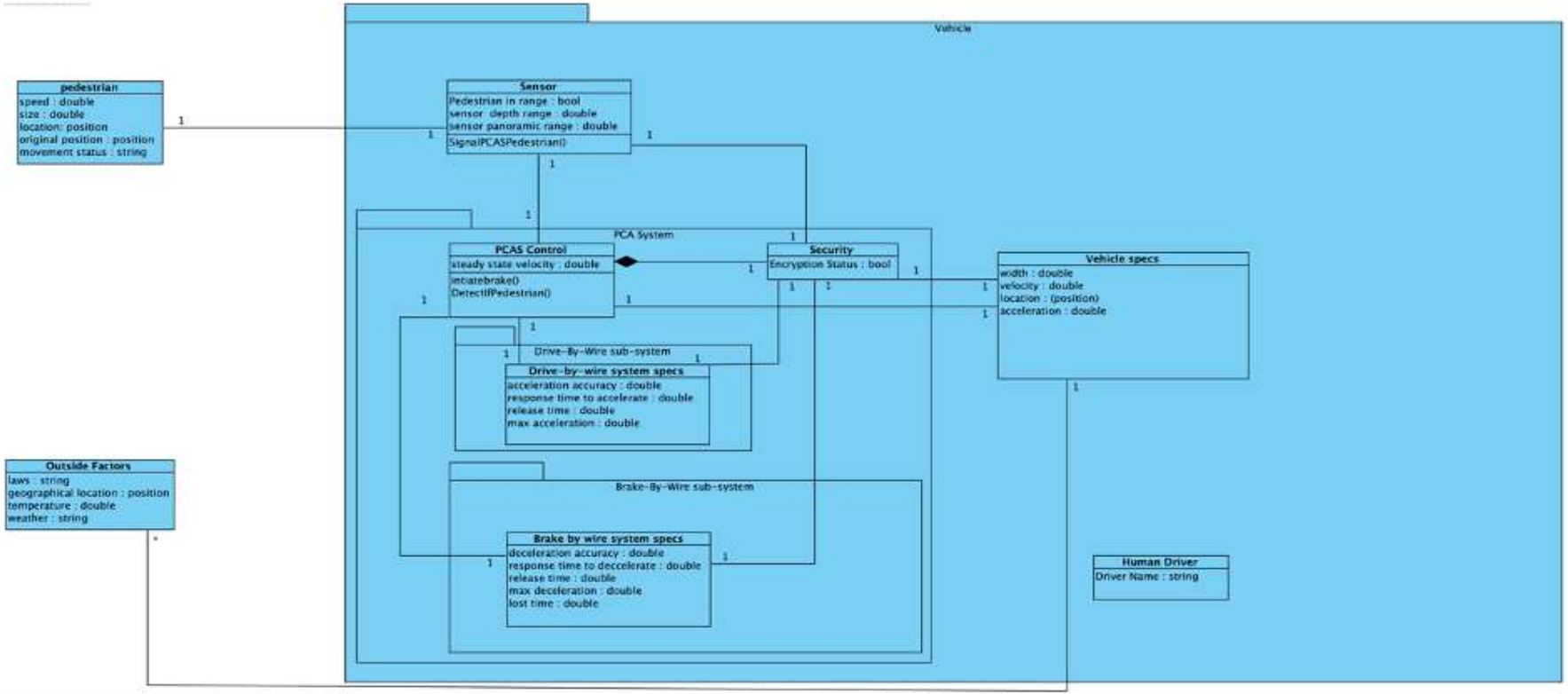
- Investigated autonomous vehicle safety
- Needed to apply domain knowledge on our pedestrian collision avoidance system
- Project Constraints
  - Absolutely no collisions in our testing
  - Minimize impact of PCAS system on efficiency
  - Address potential for cybersecurity risks

Use Case Diagram



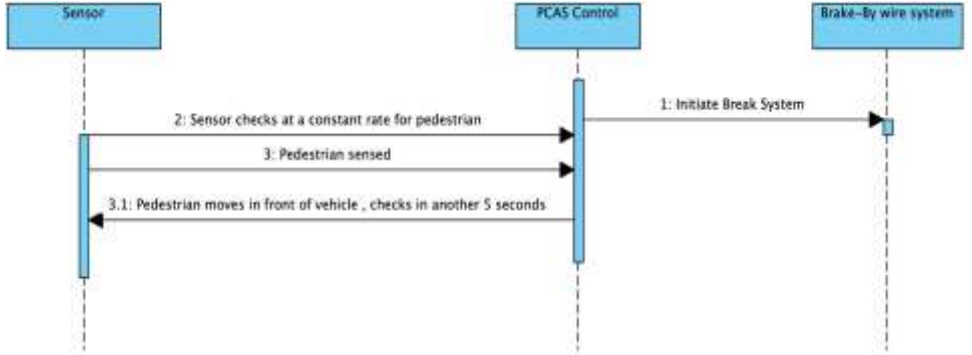
- Sensor serves as use case input.
- PCAS Control Center serves as the main Decision making component.
- Driver can checks status of PCAS through dashboard.
- PCAS decides when to activate failure operational mode.

Domain Model

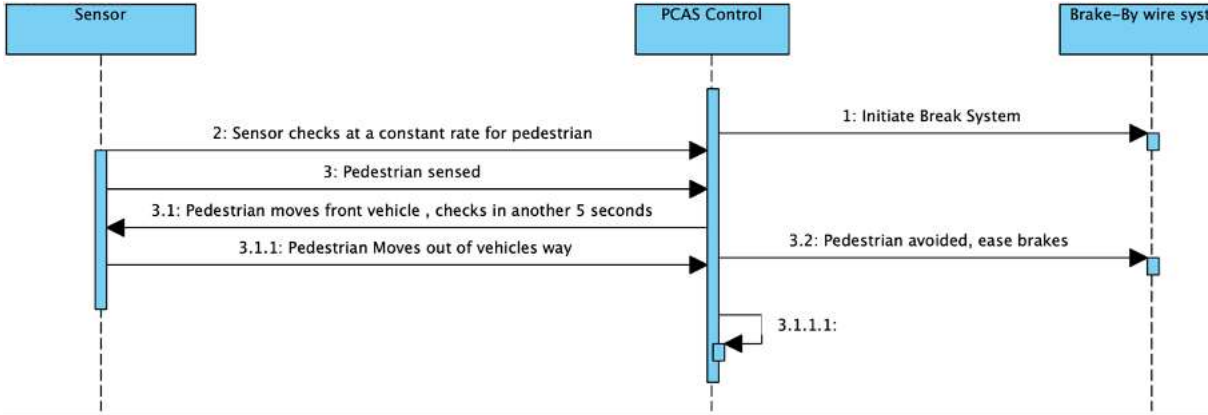


Potential Scenarios / Sequence Diagrams

- Scenario when a pedestrian is stopped in front of the vehicle.

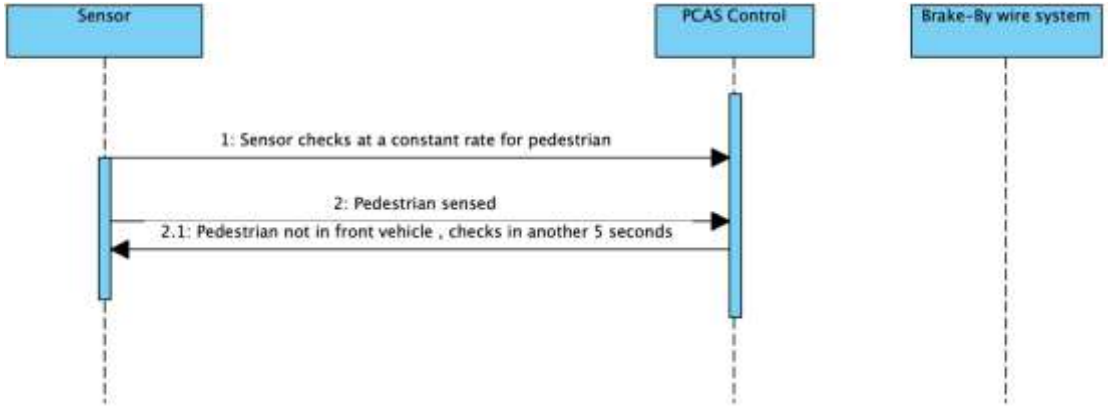


- Scenario when a pedestrian is stopped in front of the vehicle and the pedestrian moves out of vehicles way.

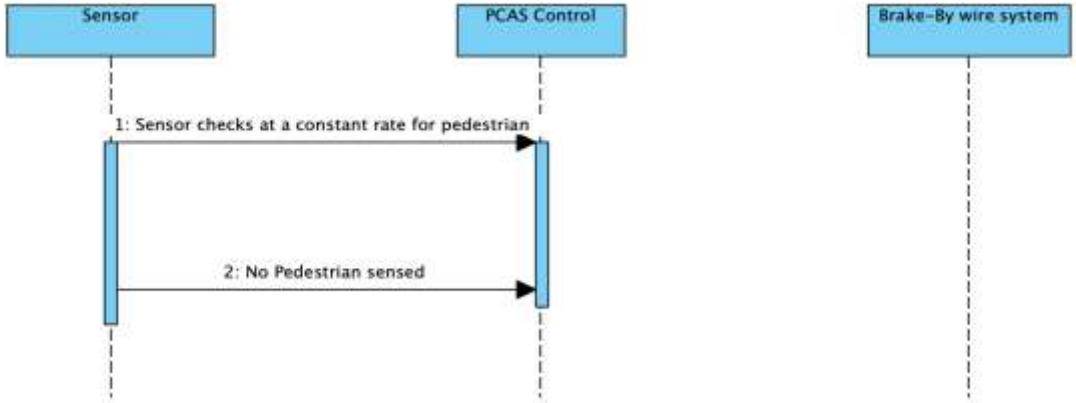


Potential Scenarios / Sequence Diagrams

- Scenario when pedestrian is sensed but not within range of vehicle.

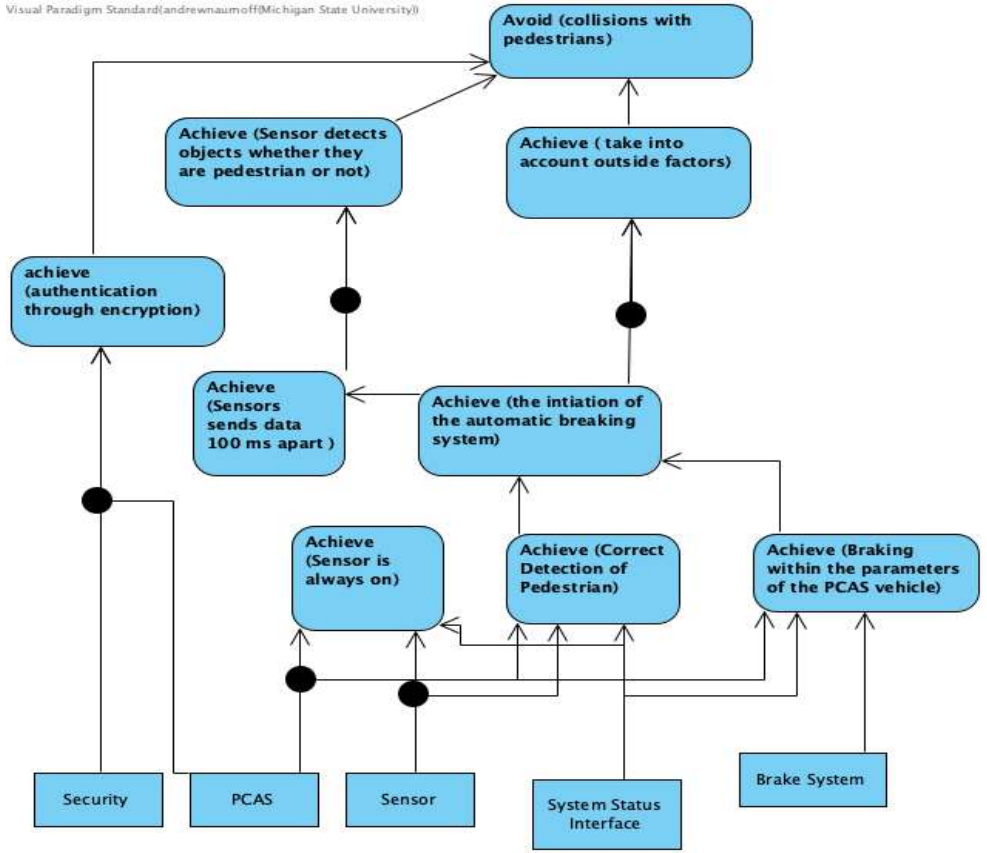


- Scenario when pedestrian nor object detected by sensor.



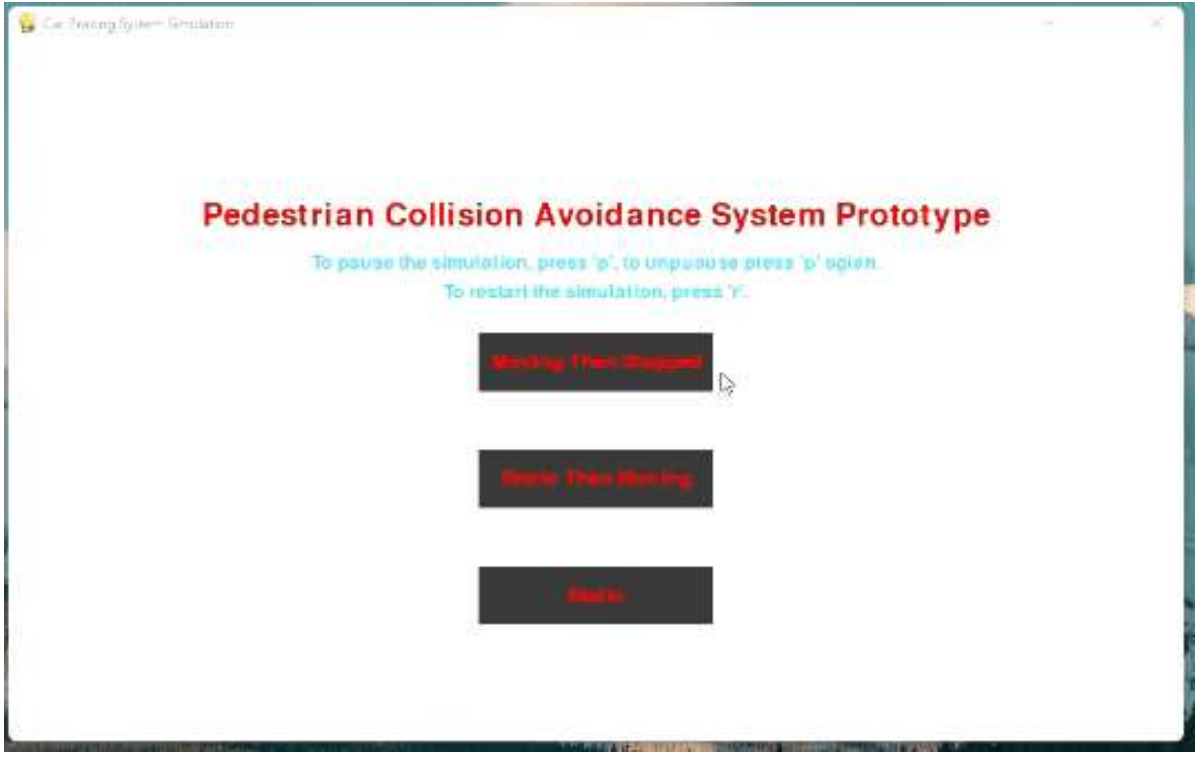
State Diagram

- The main goal of the system is to avoid collisions.
- The sensor detects if object is pedestrian or not.
- PCAS also takes into account outside factors.
- PCAS also takes into account the limits and specifications of the vehicle while braking.



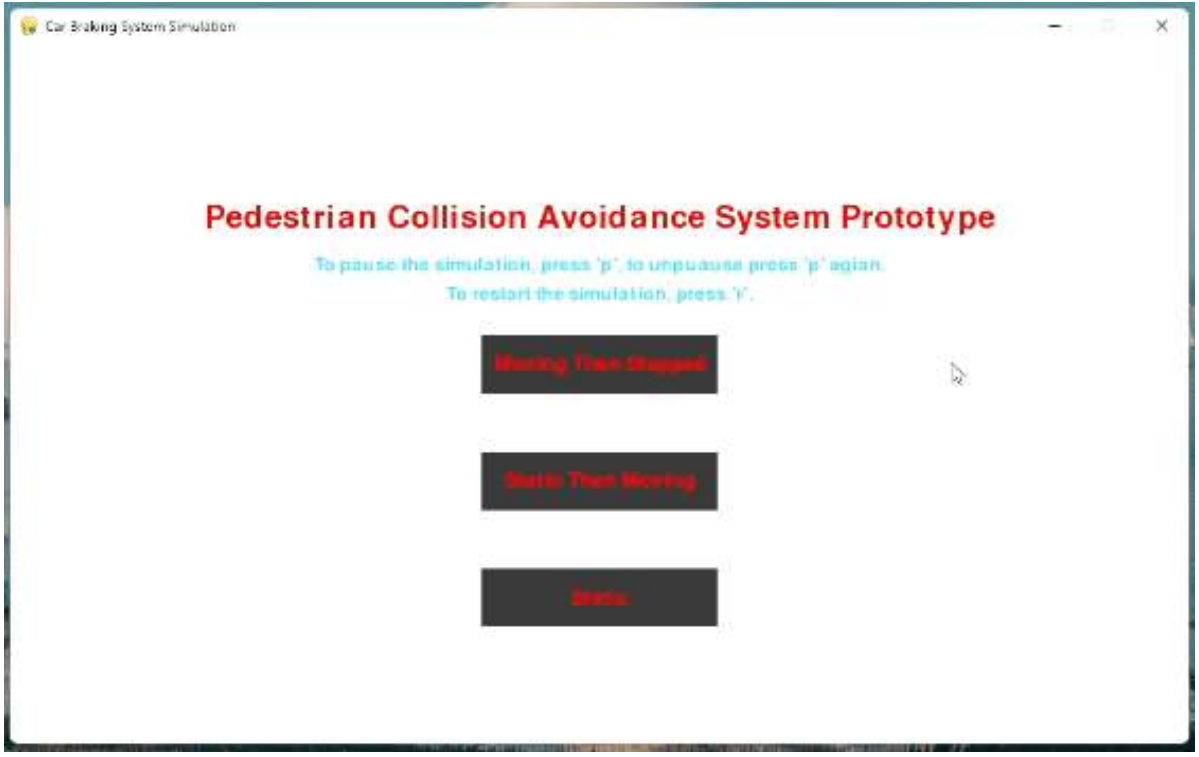
Demonstration 1

Pedestrian moving then stops in the vehicles pathway. Moving then stopped scenario 1.



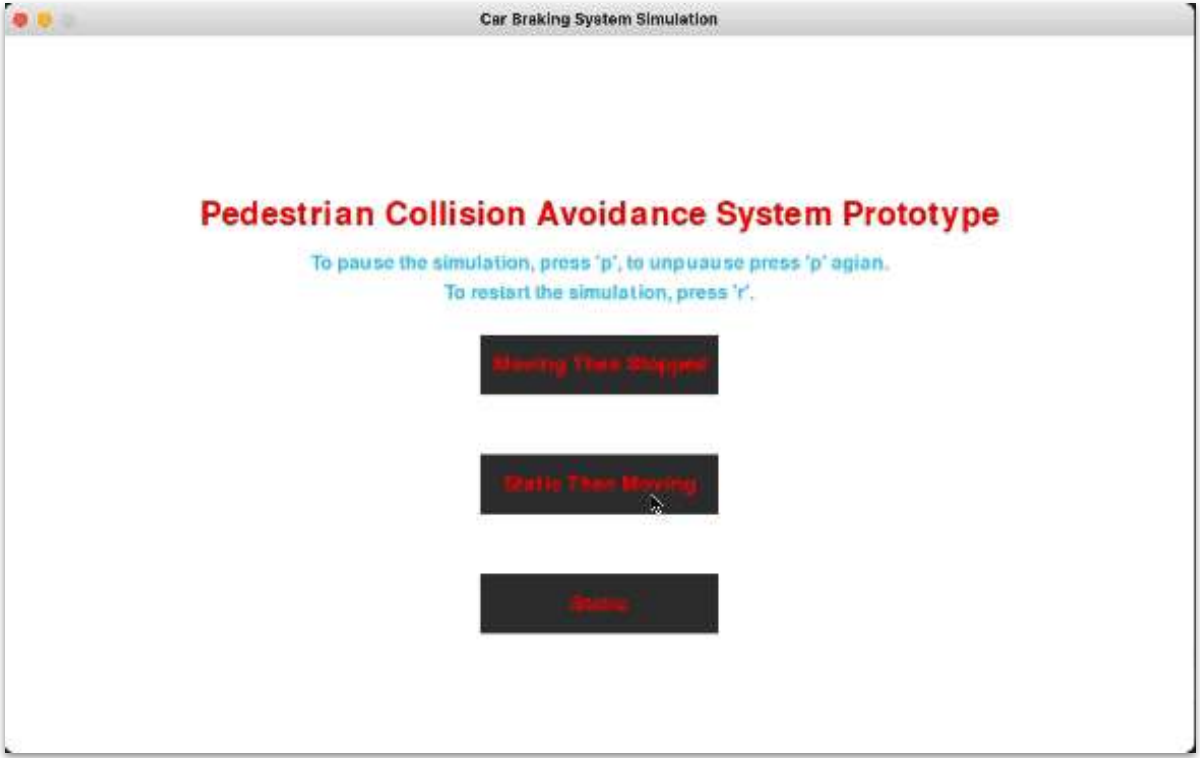
Demonstration 2

Pedestrian is stopped then moves away from vehicle path. Static then moving scenario 5.



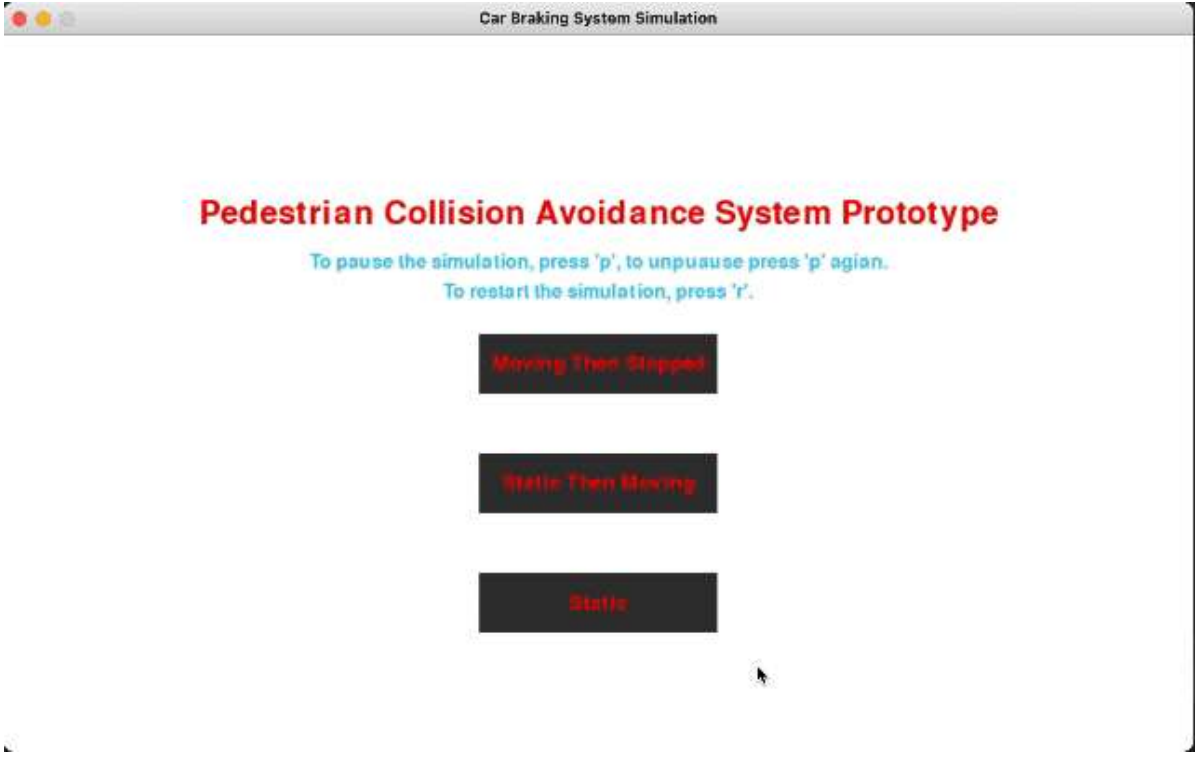
Demonstration 3

Pedestrian starts static below the vehicle path, then moves through and out of the vehicle path (Scenario 7)



Demonstration 4

Pedestrian starts and remains static in the vehicle path (Scenario 8)



Acknowledgements

We gratefully acknowledge and appreciate the participation of our customer, Mr. Chris Capaldi from Auto Konnect.