Cultivating Trust in Autonomous Vehicles

February 2018

CPS: Medium: Cultivating Trust in Autonomous Vehicles

Intellectual Merit: The contributions of this proposal are as follows:

1.
2.
3.

Educational Impact:

Broader Impact:

Contents

Cultivating Trust in Autonomous Vehicles

The story:

- Backseat driver: 3 out of 4 Americans are scared of fully autonomous cars [AAA]
- In 1900, the driverless elevator was invented - elevators used to have an operator or a 'driver' at all times. It took over fifty years, an elevator operator strike, and a coordinated industry ad campaign for driverless elevators to finally be accepted.
- Graceful Handoffs are important - People overtrust..if it works 90% of time, we think it works 100% of the time.
- Human in the loop CPS co-design is critical. Generalized to other domains and autonomous systems.
- Research has been on modeling human behavior, and interaction.
- Specifically want to focus on Trust - hard challenge - trust is a multi-dimensional signal - therefore limit to autonomous vehicles to focus on predictability, and explainability.

1 Research Description

1.1 Intellectual Merit

- Scenario based trust modeling:
  - Predictability
  - Explaniability - Local interpretability.
  - Situational awareness and feedback
  - UI interfaces - A/B testing
- Reachability analysis - linked with predictability and safe handoffs.
- Human behavior modeling
- Behavior guided autonomy

2 Evaluation/Experimentation Plan

Testbeds/Experiments:

- Reachability experiments with ground robots, F1/10 cars.
- UI design kit for Autonomous Vehicles (Matlab, Unity, linked with Pre-Scan)
- Driving Simulator: Data to measure trust, predictability, explainability,
- Driver attention and behavior.
- Virtual reality testbed ?
- What metrics will we use?

3 Project Management and Collaboration Plan

- Perrone Robotics - Letter saying they will allow access to their full scale cars and track.
- Toyota Research Institute - Support letter saying they are interested in outcomes of this research and will assist in UI development.
- IRB ?

4 Broader Impacts