**Name of Project:** Autonomous Controls Development for Prototype Electric Vehicle Truck

**Abstract:**
Students on this team will support the development of the autonomous navigation system on our prototype EV Truck. They will develop a virtual testing environment utilizing IPG’s carmaker to evaluate the robustness of our current navigation algorithms on a range of specific use cases. Existing datasets (position, sensor input, etc.) will be utilized to develop and test improvements in the navigation system. Ultimately, the improved navigation algorithms will be validated, both in the student-developed virtual testing environment, and in physical testing on the Isuzu’s ITCA proving ground. Isuzu will provide training in IPG Carmaker at the beginning of the project.

**Impact:**
This results of this project will improve the current autonomous EV truck developed at ITCA. Autonomous capabilities are critical for improving safety, overall society efficiency and promoting innovation. Additionally, the Electric Truck program is important to the environmental. This project focuses on improving the robustness and validation of autonomous electrified truck.

**Scope:**

**Include a Deliverable (Phase I) and Details Here: BASELINE GOAL**
Develop virtual testing scenarios in IPG’s Carmaker simulation software for a set of navigational use cases.
Evaluate the effectiveness of current algorithms within the virtual environment. Utilize existing testing datasets, identify “worst case” scenarios and develop these into a “Stress Test”.

**Include a Deliverable (Intermediate – Phase II) and Details Here: SUCCESS**
Based on intuition from the “stress test” and virtual environment develop an improved navigation algorithm. Validate the new algorithm within the virtual environment utilizing isolated “out of sample” data. Once an improved algorithm has been validated, implement this algorithm in a physical prototype vehicle and test it on the proving ground. A different sensor layout investigation based on virtual environment.

**Include Stretch Goals and Details here: HIGH SUCCESS**
Stretch goals may include:

- adding additional sensor packages to the truck, incorporating these sensors to deliver even higher performance and realize other capabilities.
- On-road testing of Platooning functionality for the projects.

Student Skills:

<table>
<thead>
<tr>
<th>Project Area</th>
<th>Skills</th>
<th>Likely Majors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception, Computer Vision (1-2 students)</td>
<td>Understanding of localization based on multiple methods: Camera, Lidar, Radar</td>
<td>EE, CS, Robotics, ME</td>
</tr>
<tr>
<td>Controls (2 students)</td>
<td>Path finding, path design and control of the vehicle to realize planned behavior</td>
<td>EE, CE, CS, Robotics</td>
</tr>
<tr>
<td>Data Science / virtual modeling (2 students)</td>
<td>General programming skills with an interest virtual modeling, Monte Carlo testing,</td>
<td>Data Science, Computer Science, Statistics</td>
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Desired Additional Knowledge, Skills and Experience:
Any of the following Skills, Knowledge or Experience would be valuable to the 2019 team. We don’t expect students to be familiar with all or even most of these items, but strong candidates will have familiarity or experience with some of them and a positive attitude to learn what is necessary as the project gets underway. Please highlight your experience with any of the items on this list in your personal statement on the application.

- Interest in autonomous vehicle development.
- Experience in any practical development of computer vision, perception, data fusion, controls, path finding.
- Successful team based project experience and/or professional experience in engineering
- Experience with IPG Carmaker

Location:
Most project work will take place on campus during the semesters. There will be frequent trips to the Isuzu technical park in nearby Plymouth, MI for collaborative work with Isuzu Engineers. Transportation to Isuzu Technical park in Plymouth provided by MDP
Sponsor Mentor:

Yong Sun, Supervisor, Model based development.

Umich Aero graduate (2012). Focus: autonomous driving, electrification, model based approach development.

Faculty Mentor

TBD

Legal Requirements:

Citizenship Requirements (please select)

- This project is open to all students regardless of citizenship status

Intellectual Property Agreements / Non-Disclosure Agreement Requirements (please select)

- Students will sign the standard MDP IP/NDA agreement

Internship Information

- Interviews guaranteed for students interested in a summer 2019 internship. The interviews will take place in March 2019.

Company Information:

Isuzu is the global leader in commercial vehicles and diesel engines. We consistently focus on “creation without compromise” in the process of building and maintaining a world class organization. By expanding our operations across the globe, Isuzu products benefit people in over 100 countries. To ensure the most advanced performance and superb service, we are moving forward in product development, quality, manufacturing systems and customer support, which will become the new global standards of excellence. We hold an uncompromising commitment to improvement for better products and a better partnership with the world.