Note: Citations and references are missing in this proposal

Project Proposal (by Prerana Somarapu)

1. **Title**: Navigation Safety of Autonomous Vehicles using Realistic Simulations
2. **Goal**: a high-level description of what you want to accomplish, in plain English. State the problem and main results that you would obtain in the project.

   The goal of this project is to improve navigation safety of autonomous vehicles in unexpected situations. For example, Waymo cars often stop when they encounter an unexpected situation such as a construction worker blocking the road. The goal of this project is to address this issue by creating a way for first responders or construction workers to give instructions to the car through text instructions. The accuracy of this would need to be assessed through simulations to measure how much this feature would improve navigation safety of autonomous cars.
3. **Objectives**: a concrete list of specific achievable items in the project. Objectives support the overall goal but are much more specific and concrete.
   a. Download and understand the WAYMO Large Scale language Dataset
      i. Specifically the inputs and outputs
      ii. How the data is structured
   b. Reproduce a basic simulation/visualization framework using CARLA: an open source simulator for autonomous driving research
   c. Simulate new adversarial situations (come up with new situations)
      i. Use existing metrics to compute safety
   d. Convert text instructions to driving instructions in the WAYMO dataset's format
      i. Use simulation to measure the safety
   e. Compare the pros and cons of different simulations

i. Unity 3D

ii. Unreal Engine

iii. CARLA: an open source simulator for autonomous driving research

iv. Custom simulation/ visualization framework

4. **Challenges**: Any challenges that you anticipate in the project in achieving the objectives.
    - Coming up with new adversarial situations and simulating them
    - Converting text instructions to driving instructions
    - Measuring accuracy/safety
5. **Approach**: List activities or strategies that you plan to implement to overcome the technical challenges and to achieve the objectives. Describe your plan for the project in this section.
    - Downloading and understanding the WOMD-Reasoning: Large-Scale Language Dataset
        - Specifically the inputs/outputs and how the data is structured
    - Simulating new adversarial situations
        - Using simulations to test for safety/accuracy
    - Learning more about simulations for autonomous driving systems and reproducing a basic simulation or visualization framework
        - CARLA: an open source simulator for autonomous driving research