

**ECE 5734**

Embedded Systems Verification & Validation

**Progress Report on**

VERIFICATION OF SAFETY AND SECURITY REQUIREMENTS IN AUTONOMOUS VEHICLE

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# **Summary of Project**

This project is to develop a model and verify the functional requirements of an autonomous vehicle system using the LabVIEW simulation tool. The autonomous vehicle model is one that we create, based primarily on physics and research done by others, which we implement in LabVIEW. Using the model, we will attempt to drive the vehicle based on the requirements of the currently running test and verify that the model’s outputs are within acceptable criteria for the test that’s running.

# **Completed goals of the project**

So far, we have a complete model of the autonomous vehicle implementing the algorithms and equations present in “Kinematic and Dynamic Vehicle Models for Autonomous Driving Control Design”. While creating the model was very insightful, using already present methods and designs for the autonomous model allowed us to quickly get up and running, focusing largely on the goals of the project which include verification and validation. In addition to the model, we have some basic tests implemented to verify that our current system behaves properly. These tests include driving straight at 60mph, speeding up to 20mph then braking to 0mph, and turning a full 360 degrees at 10mph. Throughout the tests, we monitor the current speed and direction of the vehicle to ensure it is within requirements of an autonomous vehicle.

# **Modifications to the project**

Despite all the work that’s gone into the project and that’s succeeded, we’ve had to modify the project a little to reduce the scope and make it more achievable. The biggest modification is in the model of the vehicle, where we no longer plan to simulate the sensors of the vehicle and instead are focusing on the desired path planning from a different system and how we should react to it. This allows us to focus on the verification and validation of the project, as opposed to getting sucked into the model and how to best represent a vehicle, so we believe it is an appropriate shift in focus. Other than that modification, very little has changed regarding the project.

# **Next steps in the project**

While we have a good start, we still have a bit of work to do. The biggest tasks still to complete include creating more tests that are more complex, such as obstacle avoidance, lane changing, and back-in parking. In addition to these tests, we want to create more tests that simulate scenarios that an autonomous vehicle may find itself in. Also, we may want to add more criteria to look through at through the model, potentially the x-y position against what we know are thresholds in the test, such as in the obstacle avoidance test in order to ensure the car never reaches a position that causes it to collide with the obstacle. With all that said, however, there isn’t a lot more to do in the project and we are confident that these goals will be achieved.