Autonomous Vehicle System Project Plan

Introduction

This document outlines a comprehensive project plan for developing an autonomous vehicle system. The plan includes following the University of Toronto's Self-Driving Cars Specialization on Coursera, complementing the coursework with practical projects and additional resources, and a suggested timeline for achieving each milestone.

Plan Outline

1. Follow the Specialization Curriculum
2. Complementary Learning and Projects
3. Practical Projects to Reinforce Learning
4. Timeline and Resources

1. Follow the Specialization Curriculum

The specialization includes four main courses:
- Course 1: Introduction to Self-Driving Cars
- Course 2: State Estimation and Localization for Self-Driving Cars
- Course 3: Visual Perception for Self-Driving Cars
- Course 4: Motion Planning for Self-Driving Cars

2. Complementary Learning and Projects

Course 1: Introduction to Self-Driving Cars

Focus: Python Programming: Automate the Boring Stuff with Python, Mathematics for Machine Learning: Coursera

Project: Simple Lane Detection using OpenCV

Resources:

- - Lane Detection using OpenCV: medium.com/@mrhwick/simple-lane-detection-with-opencv-bfeb6ae54ec0

Course 2: State Estimation and Localization

Focus: Introduction to ROS: ROS Tutorials, Kalman Filters: Kalman and Bayesian Filters in Python

Project: Sensor Fusion and Localization using simulated sensors

Resources:

- - Sensor Fusion with Kalman Filters in Python: filterpy.readthedocs.io/en/latest/

Course 3: Visual Perception

Focus: Deep Learning Specialization: Coursera, Computer Vision: Udacity's Computer Vision Nanodegree

Project: Object Detection using YOLO or SSD

Resources:

- - TensorFlow Object Detection API: github.com/tensorflow/models/tree/master/research/object_detection

Course 4: Motion Planning

Focus: Path Planning Algorithms: Artificial Intelligence: A Modern Approach

Project: Path Planning using A* and Dijkstra's

Resources:

- - Python Robotics: A Python code collection of robotics algorithms: github.com/AtsushiSakai/PythonRobotics

3. Practical Projects to Reinforce Learning

These projects will help reinforce your learning and provide practical experience:

- - Lane Detection and Following using OpenCV
- - Object Detection and Classification using YOLO or SSD
- - Sensor Fusion and Localization using Kalman Filter
- - Path Planning and Control using A*, RRT
- - End-to-End Simulation using CARLA or AirSim

4. Timeline and Resources

Estimated Timeline

Total Duration: Approximately 8-10 months (assuming part-time commitment of 10-15 hours per week)

Month 1-2: Introduction and Lane Detection
Focus: Python basics, introductory course, and lane detection project.

Resources: Automate the Boring Stuff with Python, Lane Detection using OpenCV

Month 3-4: State Estimation and Localization
Focus: State estimation course and sensor fusion project.
Resources: Kalman and Bayesian Filters in Python, ROS Tutorials

Month 5-6: Visual Perception and Object Detection
Focus: Visual perception course and object detection project.
Resources: TensorFlow Object Detection API, Deep Learning Specialization on Coursera

Month 7-8: Motion Planning and Path Planning
Focus: Motion planning course and path planning project.
Resources: Python Robotics GitHub Repository, Artificial Intelligence: A Modern Approach

Month 9-10: Integration and Simulation
Focus: Integrate all components and test in simulation.
Resources: CARLA Simulator, AirSim

Summary

This plan will help you systematically learn and apply skills in autonomous systems while progressing through the University of Toronto's specialization on Coursera. By complementing your coursework with practical projects and additional resources, you'll gain hands-on experience and build a robust portfolio.