

SYSTEMS ENGINEERING AND PROTOTYPING COURSE

Prototyping Technical Report: The Design and Construction of Autonomous Vehicle

Key Learnings and Takeaways:

Working on the autonomous vehicle gave us valuable insight into how complex it can be to design a functional system in real life. Some of the major takeaways we had include;

Understanding Autonomous Systems

- Gained practical insight into how autonomous vehicles perceive their environment using sensors like ultrasonic, Infrared and color sensors.
- Learned how decision making is handled through state machines and sensor inputs.

Sensor Integration Challenges

- Realized that real world sensor data is noisy and can be affected by environmental conditions (e.g., lighting, surface reflectivity).

PID Control in Real Life

- Learned how a PID controller is used to achieve smooth line following.
- Understood the role of tuning k_p , k_i and k_d for optimal movement balancing responsiveness and stability.

A pre-requisite report for completion of Prototyping and Systems Engineering Course:

To: Professor Stephen Henkler

By Group B 4 students :

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System Thinking

- Understood the importance of combining hardware, software and control logic into a cohesive system.
- Experienced how small issues in one component (e.g., a sensor) can impact overall system behavior.

Programming and Logic Development

- Improved skills in C/C++ programming using Arduino IDE.
- Learned to design modular code with functions, state machines and helper routines.
- Developed debugging skills by using serial output for troubleshooting sensor behavior.

Project Planning and Iteration

- Learned the value of testing in stages – first the motors, then sensors and then integration.
- Iteratively refined the system through testing, debugging and improvements.

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