EEN-400 B.TECH PROJECT

MIDTERM REPORT

TOPIC

Reinforcement Learning based stabilization of liquid surface in ground vehicle payloads

TEAM MEMBERS

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MOTIVATION

Sloshing refers to the motion of a free liquid surface inside its container. It is a complex nonlinear dynamical phenomenon which has a significant influence on the stability of the fluid system. It affects various engineering systems and processes such as liquid storage tanks, liquid rocket fuel tanks, molten metal handling in steel plants, robotic handling of liquids, etc. We aim to stabilize the free surface of a liquid inside a container placed as payload on an AGV, while the AGV traverses along specified paths in a 2-D plane.

OBJECTIVES

To use Reinforcement Learning (RL) based control to navigate an Automated Guided Vehicle (AGV) prototype in a 2-D workspace, while minimizing slosh in a liquid payload as well as following a desired path to reach the destination in minimum possible time.

METHODOLOGY

An Automated Guided Vehicle (AGV) prototype will be built which can move in 2-D and has the capability to localize in its surroundings. Design of various reference 2-D paths for autonomous navigation of the AGV in 2-D workspace will be done. Slosh measurements will be provided to the RL model to determine the feature vector. The RL based control model will be trained while navigating the AGV along the designed reference paths in the 2-D workspace. Which will in turn tune the hyperparameters.

EXPECTED OUTCOMES

- Working Hardware Prototype of AGV
- Reliable Slosh Measurement Sensing Technique
- An RL based control model for the AGV capable of minimising slosh in payload liquids while following desired 2-D paths

REFERENCES

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