Design and implementaton of Automated Teller Machine (FSM) controller

Authers:- Puspa Bahadur Budha, Mohan Bahadur Budha

1. Introduction:

The purpose of this project was to design and implement an automated trailer machine controller using Finite State Machines (FSMs). The controller aims to improve the efficiency and safety of trailer movement, making it easier for users to maneuver trailers in various scenarios.

2. Project Scope:

The project focused on creating a robust FSM-based controller capable of handling different trailer types and sizes. It aimed to provide functionalities such as autonomous parking, turning, and reversing, while also considering the integration with existing trailer systems and vehicles.

3. Methodology:

a) Requirement Analysis: The team gathered requirements from stakeholders, considering user needs, safety standards, and regulatory guidelines related to autonomous systems.

***b) Design Phase*:** The system architecture and FSM design were formulated, identifying states, transitions, and events for trailer movement.

c) Software Development: The FSM controller's software was developed, taking into account real-time sensor inputs and integration with vehicle control systems.

d) Hardware Integration: The controller was integrated with sensors, actuators, and the trailer's existing hardware for seamless operation.

e) Testing and Validation: Rigorous testing was conducted to verify the controller's performance under various conditions, ensuring safety and reliability.

4. FSM Controller Architecture:

The FSM controller was designed with the following main components:

a) State Machine: A hierarchical FSM with states representing different trailer maneuvers like forward movement, turning, and reversing.

b) Sensors: Proximity sensors, cameras, and GPS were used to provide real-time data for accurate decision-making.

c) Actuators: Electric motors and hydraulics were employed to control the trailer's movements based on FSM state transitions.

d) Communication Interface: The controller had a communication module to interact with the vehicle's main control system and receive driving instructions.

5. Functionality and Features:

a) Autonomous Parking: The FSM controller enabled the trailer to autonomously park in designated spaces, reducing the risk of accidents during parking maneuvers.

b) Turning Assistance: The controller assisted the driver in making sharp turns, ensuring precise and smooth trailer movements.

c) Reversing Assistance: The system provided real-time feedback during reversing, preventing collisions and improving safety.

d) Emergency Stop: The FSM controller had an emergency stop mechanism to halt trailer movement in critical situations.

6. Results and Conclusion:

The design and implementation of the automated trailer machine (FSM) controller demonstrated successful integration with various trailer systems. The autonomous parking, turning, and reversing functionalities showcased improved efficiency and safety.

7. Future Enhancements:

To further improve the system, future work could include incorporating advanced AI algorithms for obstacle detection and path planning, as well as exploring cloud-based data analytics for performance optimization and fleet management.

In conclusion, the design and implementation of the automated trailer machine (FSM) controller represented a significant step towards enhancing trailer maneuverability and safety. The project laid the groundwork for future advancements in autonomous trailer systems, contributing to the evolution of intelligent transportation technologies.

URL:-https://github.com/PuspaBudha/ATM-project/tree/main/puspa