Autonomous Vehicles and Robotics

Title: Autonomous Vehicles and Robotics

PROBLEM STATEMENT:

Machine Learning for Multi-Modal Object Detection and Classification*: Use sensor inputs from multiple modalities, including vision and LiDAR, to detect, classify, and localize static and dynamic objects and traffic conditions. Relevant skills: Python or C++, TensorFlow, OpenCV, Computer Vision, Machine Learning.

Navigation Control System Design*: Implement a control law to ensure accurate tracking of a vehicle's pose estimate and reference trajectory. Model-based or Reinforcement learning methods are welcome. Relevant skills: C++, ROS, Control Systems, Vehicle Dynamics.

TARGET AUDIENCE:

Pedestrian Motion Prediction: Use machine learning and filtering methods to predict and model pedestrian behavior, such as predicting when people might cross an intersection. Relevant skills: C++, Python, ROS, Computer Vision, Machine Learning, State Estimation.

Collision-Avoidance Motion Planning: Develop a path planning library for emergency maneuvering and collision-avoidance for autonomous cars. Relevant skills: C++, Python, ROS, Convex Optimization, Graph Theory, Vehicle Dynamics, Control Systems.

Vehicle-to-Vehicle Interaction: Propose interfaces and control methods for the collaborative autonomous driving problem, allowing multiple vehicles to work together as a dynamic and reconfigurable team. Relevant skills: MATLAB, C++, Python, ROS, Control Systems.

OBJECTIVES:

Autonomous Robots Lab at the University of Nevada, Reno, offers research opportunities and projects in autonomous driving.

(link unavailable) features projects like LitterBug, an autonomous trash rover, and MusicBot, an interactive music robot.

Wikipedia provides information on self-driving cars, including history, definitions, and classifications.

DEFINE:

Contact Autonomous Robots Lab or similar organizations to explore potential projects and get guidance.

Join online communities like (link unavailable) to find project ideas and resources.

Research and learn about relevant technologies, such as machine learning, computer vision, and control systems.

The target audience for autonomous vehicles and robotics can vary depending on the specific application and industry. Here are some potential target audiences:

KEY FEATURES:

1. General Public: Autonomous vehicles and robotics can benefit the general public by providing safer, more efficient, and more convenient transportation options.

2. Transportation Industry: Companies involved in logistics, delivery, and ride-hailing can benefit from autonomous vehicles.

3. Manufacturing and Warehousing: Robotics can improve efficiency and productivity in manufacturing and warehousing environments.

4. Healthcare Industry: Autonomous robots can assist in patient care, surgery, and rehabilitation.

5. Agriculture and Farming: Autonomous vehicles and robots can improve crop yields, reduce waste, and enhance farming efficiency.

6. Military and Defense: Autonomous vehicles and robots can be used for surveillance, reconnaissance, and combat operations.

7. Research and Development: Researchers and developers can use autonomous vehicles and robotics to advance the field and develop new applications.

EMPATHIZE:

1. Age: Autonomous vehicles and robotics can benefit people of all ages, from children to seniors.

2. Income: The adoption of autonomous vehicles and robotics may vary depending on income levels, with higher-income individuals being more likely to adopt these technologies.

3. Occupation: People working in industries that can benefit from automation, such as logistics and manufacturing, may be more interested in autonomous vehicles and robotics.

PROTOTYPE:

1. Tech-savvy individuals: People who are interested in technology and innovation may be more likely to adopt autonomous vehicles and robotics.

2. Environmentally conscious individuals: People who prioritize sustainability and reducing their carbon footprint may be interested in autonomous vehicles and robotics as a way to reduce emissions and improve efficiency.

BRAINSTORMING:

People with disabilities Autonomous vehicles and robotics can improve mobility and accessibility for people with disabilities.

By understanding the target audience, developers and manufacturers can design and market autonomous vehicles and robotics that meet the needs and preferences of their target market.

TEST:

Testing goals for autonomous vehicles and robotics involve verifying the system's ability to operate safely and efficiently in various scenarios. Here are some key testing goals.

TESTING GOALS:

Perception: Verify that the system can accurately detect and respond to its environment, including objects, lanes, and traffic signals.

Motion Planning: Test the system's ability to plan and execute safe and efficient routes.

Control:Validate the system's control systems, including steering, acceleration, and braking.

Emergency Situation: Test the system's response to emergency situations, such as pedestrian detection, obstacle avoidance, and emergency braking.

Fault Tolerance: Verify that the system can handle hardware or software failures without compromising safety.

Performance Testing: Speed and Accuracy Test the system's ability to operate at various speeds and accuracy levels.