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Title of the project:

IMPLEMENTATION OF DRONE IN THE AUTONOMOUS CAR USING IoT

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INTRODUCTION

A self-driving car cum drone combines autonomous car and drone features, utilizing sensors for analysis and quad copter design for lift and propulsion. Advantages of self-driving cars include optimized fuel consumption, reduced accidents, increased mobility, and enhanced customer satisfaction. Integration of a drone component provides aerial surveillance, broadening the vehicle's perspective and aiding decision-making. The drone aspect offers valuable information in scenarios with limitations for onboard sensors. Drones can fly over congested areas, inaccessible terrains, and provide real-time data for navigation and route planning. Drone deployment enhances versatility, adaptability, and autonomy of self-driving cars. Safety, regulations, and cyber security are crucial considerations for development and deployment. Combining self-driving cars and drones revolutionizes transportation with increased safety, reduced accidents, optimized fuel consumption, enhanced mobility, and improved customer satisfaction.

LITERATURE REVIEW

- C. Urmson and W. Whittaker, “Self-driving cars and the urban challenge,” IEEE Intelligent Systems, vol. 23, no. 2, 2008.
- K. Rajashekara, Q. Wang and K. Matsuse, "Flying Cars: Challenges and Propulsion Strategies," in IEEE Electrification Magazine, vol. 4, no. 1, pp. 46-57, March 2016, doi: 10.1109/MELE.2015.2509901

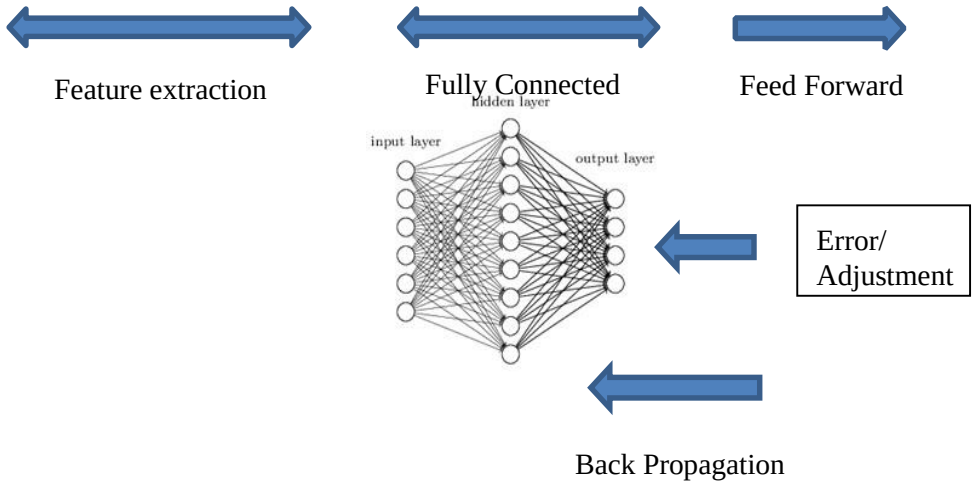
OBJECTIVES

Construct a prototype of a drone-cum-car that seamlessly integrates both components. Create a training dataset and implement simulations to develop autonomous capabilities. Develop lane detection algorithms to identify and track road lanes accurately. Implement object detection techniques to detect and track obstacles in real-time. Enable the prototype to interpret and respond to traffic signs and signals for safe operation. Train the model to recognize various traffic signs using image recognition algorithms. Ensure the prototype adjusts its behavior according to traffic signs and signals. Implement a functionality where the prototype can fly in immobile situations, such as heavy traffic or roadblocks. Enable the drone component to take over and bypass obstructions by transitioning from ground-based driving to aerial mode. Ensure the prototype can safely activate the drone's propellers, stabilize flight, and perform controlled takeoff and landing.

METHODOLOGY

The given text discusses the use of artificial intelligence and machine learning, specifically Convolutional Neural Networks (CNN), in autonomous cars. CNNs are powerful algorithms for image recognition tasks, and they have been successfully used in various computer vision applications, including autonomous driving. In the described model, only one camera is used

as a sensor for the autonomous car to reduce hardware costs. The data collected from the camera is processed by a CNN deep neural network to generate a steering model that controls the autonomous car's movement. The CNN architecture consists of convolution, pooling, and fully connected layers. The convolution layer performs feature extraction using filters, and the pooling layer reduces the dimensionality of the feature maps. The resulting feature maps are then fed into fully connected layers for image classification. The training process involves backpropagation, where the weights of the CNN are updated based on the error between the predicted output and the actual output. The process is repeated until the error rate decreases, improving the model's performance.



CNN Process

Coco SSD (Common Objects in Context Single Shot Multibox Detector) model for object detection in autonomous cars. Object detection is crucial for various tasks, such as collision avoidance, path planning, traffic sign recognition, pedestrian safety, and lane keeping. Coco SSD is a deep learning-based object detection model trained to detect 80 different object categories relevant to autonomous driving. By integrating CNNs and object detection models like Coco SSD, autonomous cars can perceive and understand their surroundings, enabling them to make informed decisions and navigate safely. The described model has been implemented and tested in a simulation environment, showing smooth and stable performance.

HARDWARE REQUIREMENT

Raspberry Pi 4 Model B

L298N Motor driver

Gear motors

Raspberry Pi Camera (5Mp)

Ultrasonic sensor

Battery 10000mAh

Electric hydraulics

Flight controller KK 2.1.5

BLDC motor 1400kv

Propellers

Electronic Speed Controllers (ESC)

Drone battery (Li)

SOFTWARE REQUIREMENT

Raspberry Pi OS

PYTHON

RESULT AND CONCLUSION

The self-driving car cum drone combines the advantages of autonomous vehicles and drones, utilizing sensors for analysis and a quad copter design for lift and propulsion. Implementing this technology through the Internet of Things (IoT) presents a solution for transportation challenges faced by society. Combining AI and autonomous vehicles can create safer roads, reduce congestion, optimize fuel consumption, and enhance customer satisfaction. This technology has the potential to transform transportation, making it more efficient, sustainable, and safe. Artificial intelligence can play a crucial role in improving the overall efficiency and decision-making capabilities of autonomous vehicles. Further research and development are essential to overcome the challenges and maximize the potential of this technology. Collaboration between industries, policymakers, and researchers is crucial to ensure the successful integration and deployment of AI-driven autonomous vehicles. Ethical considerations, privacy concerns, and regulatory frameworks must be addressed to ensure the responsible and safe implementation of AI in transportation. Continuous innovation and technological advancements will drive the evolution of AI in autonomous vehicles, paving the way for smarter and more efficient transportation systems. Education and training programs will be instrumental in preparing individuals for the changing landscape of transportation with AI and autonomous vehicles. The India has a unique opportunity to lead the way in AI-driven transportation technologies and shape the future of mobility. In conclusion, the potential of AI and autonomous vehicles, particularly the self-driving car cum drone, to transform transportation and improve our lives. With continued research and collaboration, we can unlock the full potential of these technologies and create a safer, more efficient, and sustainable future for transportation.

SCOPE FOR FUTUTRE WORK

The integration of IoT, AI, and Robotics has revolutionized unmanned vehicles, enhancing their autonomy and decision-making capabilities. These advancements have the potential to

significantly improve transportation efficiency, safety, and sustainability across various domains. Future developments may include the use of machine learning algorithms to further enhance the decision-making capabilities of autonomous cars and drones. Advanced sensors and cameras can provide more detailed information about the vehicle's surroundings, improving navigation and obstacle avoidance. Advancements in battery technology may enable longer flight times for drones and extended driving ranges for autonomous cars. These innovations would expand the practicality and applicability of autonomous vehicles in diverse scenarios. Integration with IoT enables seamless connectivity, enabling real-time data exchange and communication between vehicles and infrastructure. This connectivity can facilitate intelligent traffic management, optimized routing, and coordinated vehicle-to-vehicle interactions. Applications for autonomous vehicles span across industries, including transportation, logistics, agriculture, surveillance, and emergency services. Efforts in research and development continue to push the boundaries of unmanned vehicle technology, driving further innovation. Collaboration between academia, industry, and policymakers is essential to address technical, ethical, and regulatory challenges. Safety remains a top priority, and robust cyber security measures must be implemented to protect these interconnected systems. Public acceptance and trust in autonomous vehicles play a crucial role in their widespread adoption and integration into society. Educational initiatives and training programs are vital to prepare individuals for the evolving job market and skill requirements. Government support and regulations that foster innovation while ensuring public safety are essential for the growth of this technology. The integration of drones in autonomous cars using IoT represents a transformative leap in transportation systems. Continued research and development will lead to even more advanced and efficient solutions that reshape the future of mobility. With the convergence of AI, IoT, and Robotics, we can expect an exciting era of intelligent and interconnected transportation.