LOCALIZATION FOR ELECTRIC VEHICLES USING ADAPTIVE Q-LEARNING FOR SMART TOURISM: THAILAND CASE STUDY

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ABSTRACT

Localization plays a pivotal role in ensuring the precise navigation and safety of electric vehicles (EVs), particularly in the context of smart tourism. Traditional localization methods often encounter challenges in dynamic environments, such as urban areas in Thailand, where signal interferences and obstacles are prevalent. This paper presents a case study on the application of adaptive Q-learning to enhance localization accuracy and efficiency for EVs in Thailand's smart tourism sector. The proposed approach dynamically adjusts the learning rate based on real-time environmental feedback, allowing the system to adapt more effectively to changing conditions. The adaptive Q-learning algorithm is implemented and evaluated in a simulated environment using a combination of GPS, LiDAR, and IMU sensors. Experimental results reveal substantial improvements in localization accuracy, reduced convergence times, and increased computational efficiency compared to conventional Q-learning methods. These findings highlight the potential of adaptive Q-learning as a robust and efficient solution for EV localization in Thailand's diverse and dynamic urban landscapes. Future research will focus on optimizing the reward function, investigating alternative state representations, and pursuing real-world applications.

Keywords: Localization, Electric Vehicles, Adaptive Q-Learning, Machine Learning, Navigation, Smart Tourism

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