Chapter 12
Examination of the Recent Research Trends on Controllers in the AI Powered UAV

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ABSTRACT

The development of AI is based on research into the patterns and processes of human thought. Improved software and systems are developed as a direct outcome of these research initiatives. Deep learning (DL), a subfield of AI, allows computers to robotically acquire new abilities by analysing training sets, which are collections of previously received data. The AI technique known as deep reinforcement learning is very useful for autonomous UAVs. The fundamental characteristics of autonomous driving, particularly talks and human conversations, including making choices, make robotic motor vehicles the perfect fit for reinforcement learning. This paper presents a new viewpoint by exploring the AI features realized in current journals. This article aims to realize the attitude control is so important for UAVs and moreover AI controller is better than a conventional one. This article explores the abundant AI technologies that may be utilized for attitude control, path planning and obstacle avoidance of UAVs with many applica-

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tions. Illustrates the way AI in UAV systems on an everyday basis.

1. INTRODUCTION

Researchers have been giving increasing attention to unmanned aerial vehicle (UAV) systems due to the aircraft industry's recent upheaval since these systems have both military and civilian uses. Four distinct types of unmanned aerial vehicles (UAVs) are distinguished by the lifting force generating method: Unmanned Aerial Vehicles (UAVs) prepared with fixed wings are able to take flight thanks to the lifting force, which is created indirectly by the combination of frontward drive and the aerodynamically designed cross-sections of the wings. Unmanned Aerial Vehicles (UAVs) that have rotatable or flapping wings counteract gravity by drawing on lifting force, which is the density differential between air and gas. Hybrid UAV wings combine the best features of fixed and rotating wing designs. Unmanned Aerial Vehicles (UAVs) that employ gas envelopes to create lift utilise the disparity in density as opposed to wings. Researchers further divided these four groups based on their structural properties and used specific instances to describe them (Lee, C et al., 2021). Photographing, mapping out routes, searching for missing persons, inspecting power lines and civil building sites, etc., are just a few of the many applications of unmanned aerial vehicles (UAVs) (Ahmed, F et al., 2022).

Rescuing people from disasters requires unmanned aerial vehicles to adhere to strict regulations. Drones, UAVs, and other similar Aircraft need a unique level of aeronautical expertise and stability to fly in complex environments through all kinds of weather and dangers (Lyu, M et al., 2023). Accurate navigation and positioning abilities are essential for underwater UAVs to locate targets and assist with mobility quickly Concerning UAVs (user-friendly aerial vehicles), the study focuses on the guiding principles, methods of analysis, models of dynamics, and control rules (Umamaheswaran, S et al., 2020). The military relies on unmanned aerial vehicles (UAVs) for a different type of tasks, including surveillance, navigation, and secure communication. Monitoring assignments, medical technology, automated transportation, precision agriculture, remote sensing, power-line examination, wireless communication, disaster assistance, and search & rescue are just a few other sectors that they find use (Mohsan, S. A. H et al., 2023). The widespread availability of powerful computers, advanced control systems, and dependable communication networks in the last several decades has piqued the attention of researchers throughout the world in unmanned aerial vehicles (UAVs) (Zuo, Z et al., 2022). Sliding mode control is employed to enhance the system's resilience, as UAVs are susceptible to external forces disrupting their flight. Lastly, simulation is used to confirm that the control rule is effective and can withstand unforeseen scenarios (Wang, Z et al., 2022). The stringent standards for flight safety make the advent of aircraft oscillations a major topic. Even if there are multiple redundant mechanisms in place, air mishaps still happen. Therefore, manufacturers must focus on making aircraft technology more reliable (Andrievsky, B et al., 2022). On the other hand, UAV control has been utterly transformed by incorporating AI technologies, which provide superior efficiency, resilience, and adaptability. Academics investigating the potential uses of UAVs have come to the realisation that a flock of UAVs may do more when they cooperate on a mission. Managing unmanned aerial vehicles (UAVs) is challenging since their operational conditions are unpredictable (Phadke, A et al., 2022). Remotely Piloted Aircraft Systems powered by AI have great potential for improved mission capabilities, system flexibility, analytical precision, and decision-making breadth (Aibin, M et al., 2021). An extensive amount of research has focused on various aspects of designing the flight routes of unmanned aerial vehicles. Nonetheless, groupings of UAVs