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STUDY OF CONTROL STRATEGIES FOR DATA-DRIVEN DYNAMICS OF QUADCOPTERS

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Abstract. The exploration of control strategies tailored to the data-driven dynamics of quadcopters represents a critical avenue in the advancement of aerial robotics. This research endeavors to conduct a comprehensive comparative study of various control methodologies optimized for quadcopter dynamics, emphasizing their adaptability, robustness, and suitability for real-world applications.

Introduction. Quadcopters, with their agile maneuverability and versatile applications, have become indispensable in fields such as surveillance, aerial mapping, and emergency response. However, their inherently unstable dynamics necessitate sophisticated control strategies to ensure stable flight and precise navigation. Conventional control paradigms often fall short in addressing the dynamic complexities inherent in quadcopter systems, underscoring the need for data-driven approaches to enhance performance and responsiveness.

Main part. The study investigates a spectrum of control strategies tailored to the data-driven dynamics of quadcopters, encompassing classical Linear Quadratic Regulators, robust control techniques, and advanced machine learning algorithms. While Linear Quadratic Regulators offer simplicity and ease of implementation, they may lack the adaptability required to handle varying environmental conditions and system uncertainties. Robust control methodologies (Reinforcement Learning), on the other hand, strive to mitigate disturbances and uncertainties, enhancing the stability and reliability of quadcopter flight.

Moreover, the research delves into the application of machine learning algorithms, such as reinforcement learning and neural networks, for adaptive control in dynamic environments. By leveraging sensor data and computational techniques, these algorithms enable quadcopters to learn and adapt their control policies autonomously, enhancing performance in complex and unstructured environments.

Conclusion. Through rigorous analysis and comparative evaluation, this study sheds light on the efficacy and applicability of diverse control strategies for data-driven dynamics of quadcopters. While each approach offers distinct advantages and trade-offs, the integration of machine learning algorithms holds promise in enhancing the agility, autonomy, and resilience of quadcopter systems.

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