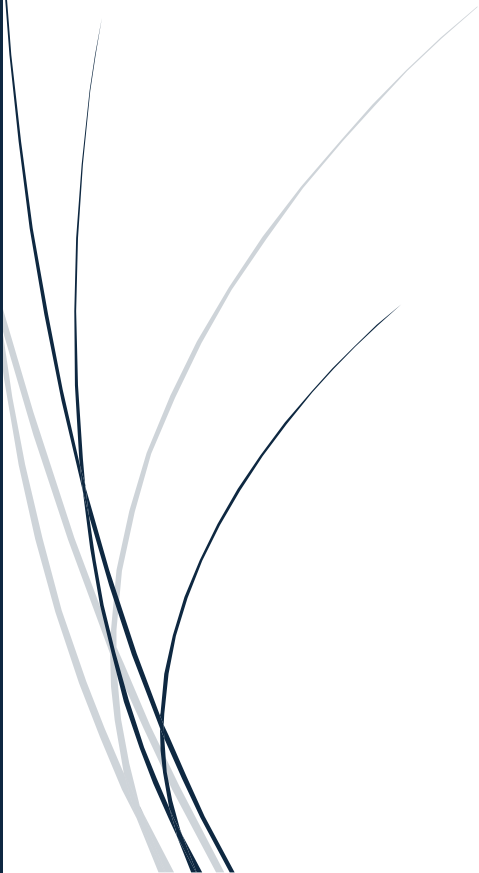




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Tello DJI Drone Robotics Project



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Tello DJI Drone Robotics Project Report

Introduction

This report details the project undertaken with a Tello DJI Drone for an Introduction to Robotics course. The project's aim is to practically explore and implement concepts related to motion planning, path planning, collision detection, and the use of algorithms within robotics. The Tello DJI Drone serves as an ideal platform due to its accessibility, ease of use, and capability to be programmed for various automated tasks.

Literature Review

Recent studies in the field of robotics and autonomous systems have increasingly focused on the utilization of drones for various applications, including surveillance, delivery, and environmental monitoring. Specifically, research by Feng et al. (2021) emphasizes the importance of efficient path planning and obstacle avoidance techniques in enhancing the autonomy and safety of drone operations in complex environments. Another significant contribution by Zhao et al. (2020) explores the use of computer vision and artificial intelligence to improve drones' navigational capabilities, allowing for real-time obstacle detection and avoidance. These studies underline the evolving nature of drone technology and its growing application in solving real-world problems, highlighting the relevance of projects that aim to explore these capabilities further.

Research Method and Project Design

Research Method

The project adopts an experimental research method focusing on practical implementation. The approach involves designing, programming, and testing various functionalities on the Tello DJI Drone, with an emphasis on real-world application.

Project Design

The project is structured around a series of experiments designed to test the drone's capabilities in motion planning, path planning, collision detection, and the application of algorithms for autonomous navigation.

- **Controlled Environment Setup:** A series of tests will be conducted in a controlled indoor environment, equipped with markers and obstacles to simulate different navigational challenges.
- **Implementation and Testing:** The drone will be programmed to execute tasks including automated takeoff and landing, path following, obstacle avoidance, and energy-efficient route planning. Each task will incorporate specific algorithms and techniques, such as A* for path planning and OpenCV for obstacle detection.

- **Data Collection and Analysis:** Data on the drone's performance, including accuracy of path following, obstacle detection rate, and battery efficiency, will be collected and analyzed to assess the effectiveness of the implemented features.

Key Scopes/Constraints

- **Hardware and Software Limitations:** The Tello DJI Drone's limited onboard processing power and lack of advanced sensors restrict the complexity of real-time data processing. Additionally, reliance on specific software libraries may limit the scope of implementable features.
- **Environmental Constraints:** The project is confined to an indoor setting to ensure controlled testing conditions, limiting the exploration of outdoor navigational challenges.
- **Time Constraints:** The academic timetable imposes a strict deadline for project completion, necessitating efficient time management to meet project milestones.
- **Technical Expertise:** The project's success is contingent on the team's ability to effectively apply complex algorithms and programming techniques within the constraints of the chosen platform.

Conclusion

This project represents a comprehensive exploration of key robotics concepts through the practical application of the Tello DJI Drone. Despite facing hardware, software, and environmental constraints, the project aims to demonstrate the potential of drones in automated tasks and their growing importance in the field of robotics. Through this hands-on approach, we anticipate gaining valuable insights into the challenges and opportunities of drone technology, contributing to the broader understanding and application of robotics principles.