

Project Proposal: Design and Integration of Robot Arm with Quadrotor Platform for Object Manipulation Using RTK GPS and Vision

1. **Introduction:** The purpose of this project is to design and integrate a two-link robot arm onto a quadrotor platform to enable object manipulation capabilities. By incorporating Real-Time Kinematic (RTK) GPS and vision using Raspberry Pi and a Pi camera, the project aims to enhance the platform's localization accuracy and enable autonomous hovering, object detection, and grasping capabilities.
2. **Objectives:** The project will focus on achieving the following objectives:
 - Designing and building a two-link robot arm that can be securely mounted on the quadrotor platform.
 - Integrating the RTK GPS system with the quadrotor to enhance its location accuracy for precise navigation and positioning.
 - Implementing computer vision algorithms on Raspberry Pi to detect objects of interest.
 - Developing control algorithms (or improve the existing ones) for the quadrotor and the robot arm to enable autonomous hovering and object manipulation tasks.
 - Conducting experimental tests to evaluate the performance of the integrated system in terms of accuracy, stability, power consumption and object grasping success rate.
3. **Methodology:** The project will follow the following methodology:
 - Conduct a literature review on quadrotor platforms, robot arm design, RTK GPS systems, computer vision algorithms, and control strategies for autonomous systems.
 - Design and construct the two-link robot arm, ensuring compatibility and stability when integrated with the quadrotor.
 - Integrate the RTK GPS system with the quadrotor, establishing a reliable communication link and implementing necessary data fusion techniques.
 - Develop computer vision algorithms on Raspberry Pi to detect objects from the camera feed and calculate their precise positions.
 - Implement control algorithms to enable autonomous hovering, object tracking, and grasping using the quadrotor and the robot arm.
 - Perform comprehensive testing and evaluation of the integrated system, considering factors such as accuracy, stability, robustness, and object grasping success rate.
4. **Deliverables:** Upon the successful completion of the project, the following deliverables will be provided:
 - A fully functional quadrotor platform integrated with a two-link robot arm.
 - Documentation of the robot arm design and integration process.
 - Software implementation of the RTK GPS system, computer vision algorithms, and control strategies.
 - Experimental data and analysis results demonstrating the system's performance in terms of accuracy, stability, and object manipulation capabilities.
5. **Software tools:** SolidWorks, Altium, MATLAB, Webots
6. **Conclusion:** The proposed project aims to design and integrate a two-link robot arm onto a quadrotor platform, enhancing its capabilities for autonomous hovering, object detection, and manipulation tasks. By incorporating RTK GPS and computer vision algorithms, the system will achieve improved accuracy and enable precise object grasping. The successful completion of this project will contribute to the advancement of aerial robotics and autonomous systems.