Drone Controller Design and Deployment

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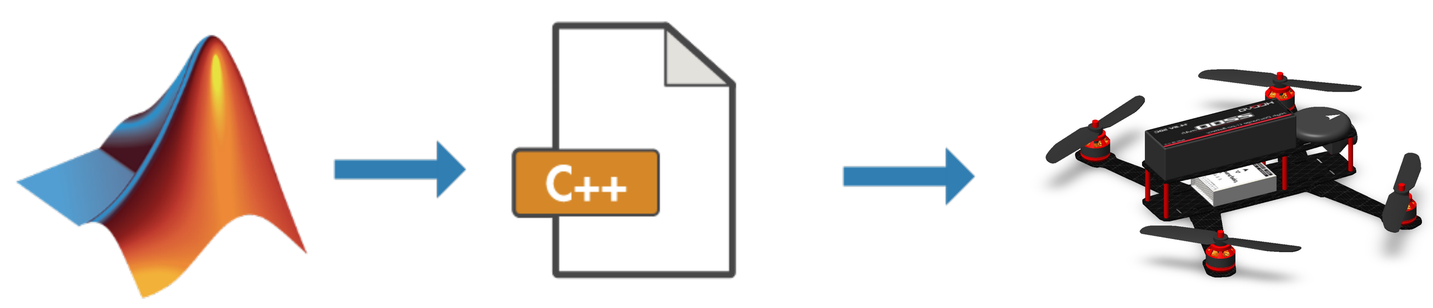
Project Background

Unmanned aerial vehicles (UAVs) have become a popular field of choice for tasks and activities ranging from leisure photography to scientific exploration. Development and application have been prominent in a variety of industries and the field will continue to expand. In the current years MathWorks® has played an important role in making UAV controller system design more accessible. In this project students will use Simulink® to create and design a flight controller pilot system which will be run on a popular QAV250 drone with a Pixhawk 4 processor.



Project process

Project Objective

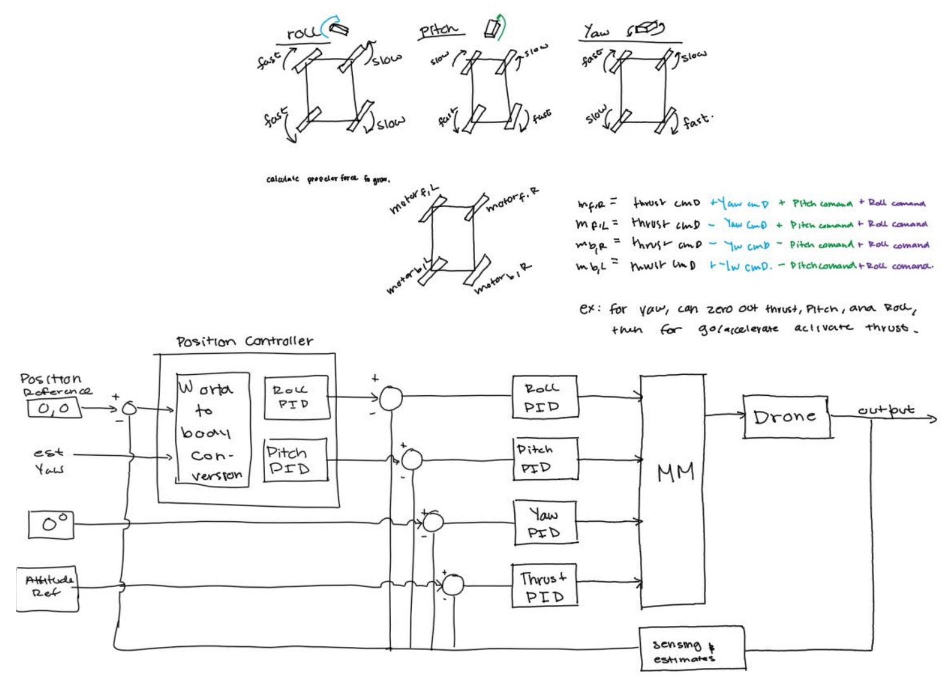
The objective is to design and build a piloted mode control system for a QAV250 quadcopter. The system must be able to be driven via radio controller and receive commands to move in six degrees of freedom from user in a 30-foot radius.

System Requirements

No.	Requirement	Performance Objective	Capability
1	Controller System	RC Input action & output drone command	RC piloted mode communication
3	Thrust, roll, pitch & yaw	Spin corresponding motors according to input command	Flight direction control
4	propeller guard	90° and 3” by 3” protection	Impact absorption
5	Radio Controller	Sufficient joysticks and switches	Dual hand maneuvering

Design Approach

Concept

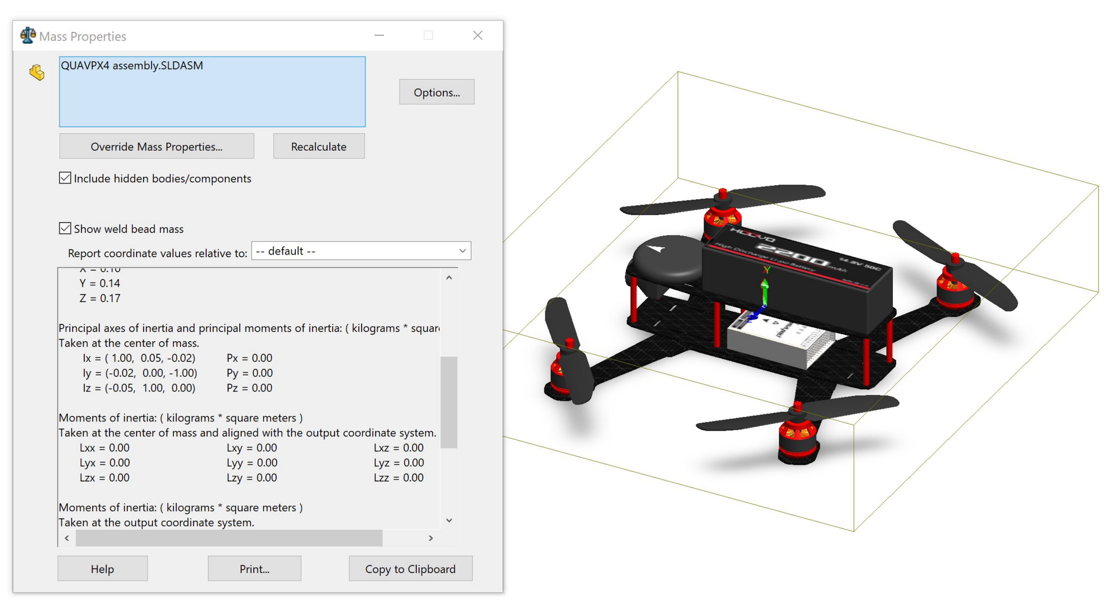


Controller system concept, Atkins

The concept for the controller system is based on a common quadcopter controller.
The outline serves as a base mapping for the equipment used, and basic desired functions such as: motor mixing algorithm, sensor block, input, output, thrust, roll, pitch, and yaw PID controller placing.

This stage helps determine initial motor orientation and outline of our control system .

Limitations

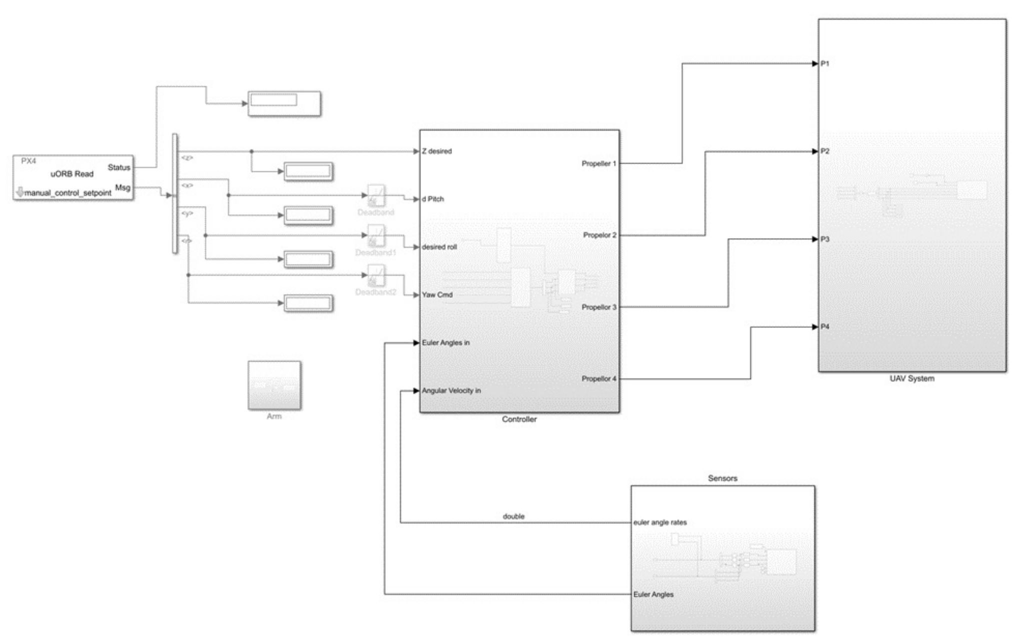


Drone Solidworks model, Valencia

Solidworks simulation used to determine maximum hover height as well as the quadcopters’ moments of inertia.

Controller system commands are limited to the physical capabilities of the quadcopter. This can be motor output power, onboard sensors, system sample time and telemetry range.

Implementation



PX4 Control System, 7A

Hardware specifications along with physical limitations are inputted into the Simulink model in order to create an accurate flight simulation for our control system.

Changes in model settings will successfully implement the controller into the PX4 autopilot.

Results & Conclusion

Responds to RC control thrust, roll, pitch and yaw commands.

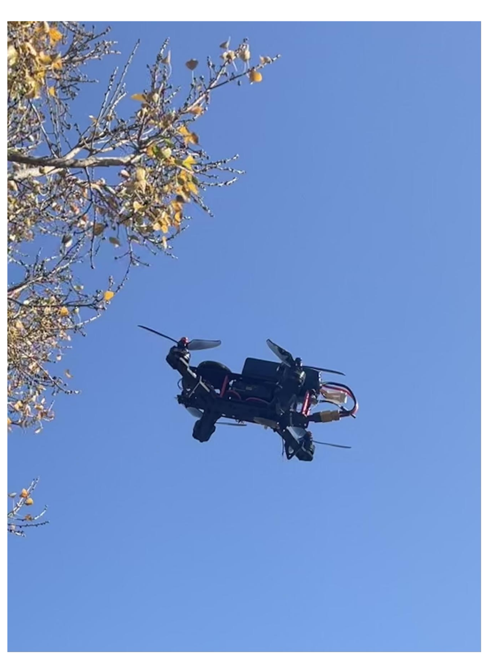
Increased throttle based on joystick action.

Successful arm switch activation via RC

Successful kill switch deactivation via RC

Consistent sensor readings from drone including; accelerometer, gyroscope, and GPS.

Drone was able to respond to thrust roll pitch and yaw commands however, motors were not able to spin continuously therefore the model has not been flashed to the quadcopter.



Acknowledgements

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