

Quadcopter Project Proposal

ROBO 410 Dr. Mark Yoder

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1 Executive Summary

The goal of this project is to create a plug-and-play quadcopter add-on, or cape, solution for the BeagleBone Black. With the recent explosion of quadcopters among hobbyists and researchers, a platform that is affordable, powerful without being overwhelming, and expandable fills a unique niche in the current market. With the release of TI's BeagleBone Black, a very capable yet affordable embedded processor, all three of these goals are attainable. The successful completion of this project would result in a mechanical design for the quadcopter frame, a BeagleBone Cape that houses sensors and motor controllers, integrated flight control software for in-flight stabilization, and the ability to communicate with a control base. We will be leveraging both our resources at TI as well as the open source community throughout the course of our project, and plan on open sourcing the mechanical designs, PCB schematic and layout files, and source code.

2 Walkthrough

The client contact at TI (currently Jason Kridner, the main software developer on the Beagle Board/Bone platform) wants a quadcopter expansion board/cape for the BeagleBone Black that is out of the box ready to fly or almost ready to fly quadcopter, yet can still be expanded upon by the hobbyist community and the users themselves.

The QuadCape and BeagleBone Black can be ordered on the client's website or through selected third party distributors. Upon delivery, the customer will open the packaging and assemble the kit by attaching the BeagleBone Black to the QuadCape, and attaching motors, propellers, and a battery (all of which are either shipped with the kit or provided by the user).

After enabling flight mode by pressing the on switch on the cape, an LED will light indicating that the quadcopter has power and it's sensors have been initialized. The quadcopter will then begin to fly; stably and slowly raising altitude relative to its initial altitude. The user will then be able to control the quadcopter via wireless communication: either a laptop or a mobile device (phone or tablet).

To add functionality to the quadcopter, the customer can add software through the continually evolving open source community that already exists around the BeagleBone. The customer can also add hardware to the quadcopter through any of the multiple ports of the BeagleBone Black by adding capes or modifying the QuadCape board and building one themselves. If the user happens to break anything, parts for the QuadCape or the quadcopter frame will be available for purchase, and the design files will be published so users could build their own replacements. Through this open source community the quadcopter will have greater opportunity to be any type of project the client chooses, and will boost the reputation of TI and the BeagleBone.

3 Domain Model

4 Stakeholder Model

5 State Model

6 Logical Architecture