Quadcopter Video Surveillance UAV
Interim Report

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Group: 7
Supervisor: Michael D. Adams

Due: Oct. 16, 2012

Project Description and Motivation:

The end goal of our project is to build a remotely controlled quadcopter with a mounted camera capable of streaming live video to a display monitor. Thanks to an abundance of open source quadcopter designs and hobby kits, we will be focusing primarily on designing the camera peripheral.

A portable (and relatively inexpensive) remotely controlled UAV with video surveillance capabilities can be used for a variety of applications. The media can use it to provide aerial footage; firefighters can examine large buildings to see where the fire has spread; the military can use it as a short range scout; and the police can use it to track fleeing criminals. The quadcopter can potentially become a cheap alternative to many scenarios requiring aerial video coverage which is currently provided by manned helicopters.

The project may be further improved by implement several additional features such as automation and human recognition. Automation would require an AI controller for the device and proximity sensor for collision detection. The advantage of automation would be that the UAV could follow specific flight plans while avoiding obstacles allowing it to efficiently scan large areas. Human recognition could be implemented either through pattern recognition through the video feed or thermal imaging. The advantage of human recognition would allow the device to quickly detect victims, targets or people of interest depending on the application for which it is being used.

Work Plan:

We will begin by researching the best method to transmit the video. As the camera needs to wirelessly connect to the desired display, there is a limit to the amount of information we can send while maintaining a live feed. The frame rate and resolution of the video needs to be adjusted such that it maximizes its bandwidth usage, providing a useful image to the user without lagging. Using this information, we can select an appropriate camera and transmitter. Additional factors to consider besides the video quality are the size and weight of the equipment. A quadcopter is a lightweight vehicle and there is limit to the load it can carry. Preferably, we can find a camera system that is small and light, while retaining high performance specifications.

With the camera equipment chosen, we can now select an appropriate quadcopter design. Many open source blueprints and hobby kits are available online, with building costs ranging from only a few hundred dollars to upwards of a thousand dollars. Our design choice will be constrained by our estimated budget and the characteristics required for the camera system. The quadcopter needs to be able to generate enough lift to fly with the camera system’s additional weight and still be capable of reaching a set height. The flight needs to be stable and the UAV must have an acceptable flight time as well.

From there, further research on the mechanics of transmitting the live video to a display accessory such as a smartphone or perhaps, a built in screen in a controller will begin.

The project will then continue in the ELEC/CENG 499 class. The findings in the ELEC/CENG 399 project will be researched further and will be split into two main stages: building the quadcopter and programming the camera system.

Milestones:

There are four milestones to our project:

1) Research in choosing an appropriate camera system
2) Research in choosing an appropriate quadcopter design
3) Research in live video transmission
4) Culmination of research into final report

Deliverables:

The final deliverable is a final report summarizing all our findings. This report will serve as a potential guide for our future ELEC/CENG 499 project.

Log Book:

Sept 20th	Anton shows interest in working on a project based upon remote controlled quadcopters. We discussed possible applications of such a device and decide to form a group.
Sept 22nd	Research on quadcopters reveals that many open source designs are available online. In order to create a more feasible project due to the time constraint, we decide to focus on developing a camera system for a quadcopter that can stream live video to a display such as a smartphone or a monitor on the controller.
Sept 27th	Joined the ELEC/CENG 399 Google group to find potential group members interested in our project.
Sept 28th	After explaining our idea, Matt joins our group.
Oct 9th	Due to miscommunication, we just found out that Matt had already left our group to work on another project. Contacted Saied who was in a similar situation as us on Google groups.
Oct 11th	Meeting with Dr. Adams Introduced the concept: -Primary goal: build a controllable UAV quadcopter with live video streaming -Focus on video transmission as quadcopter hardware is open source New ideas presented by Dr. Adams: -Bandwidth of wireless video link -Video compression for real time video feed -Operating system of the camera -Wireless technologies used Received reply from Saeid that he has already joined another group.
Oct 14th	Wrote first draft of the interim report.
Oct. 16th	Final edit of the interim report and emailed final copy to Dr. Adams.

Log book grade (25%): _____

Report grade (75%): _____

Total Grade (100%): _____

Supervisor's Comments:

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Supervisor's name (Print) Signature Date

Notes for the supervisor:

1. Please return the marked hard copy to Prof. Tao Lu by Monday, October 23.
2. Attached additional pages for comments if necessary.