Weekly Status Report 7

Quadcopter Cameraman

sdmay19-42
October 22– October 29

Aamid Ahbab (Lead Engineer) & Client
Zhengdao Wang (Team Advisor)
Alex Nicklaus (Lead Test Engineer)
Isaac Holtkamp (Web Manager)
Nate Allen (Report Manager)
Luke Rohl (Meeting Facilitator)

This week's accomplishments

Summary

On the hardware side of things: Parts have finally arrived so we have schedule a time for our team together to work on assembling our drone. In the meantime we have continued to focus on research. Alex performed real world experimentation with a mini drone to examine the physics of flying a drone, while Aamid looked into using different libraries to integrate with the on board flight controller.

On the software side: This week was largely research and planning focused. Integration between software components were discussed, and still need to be planned out. Nate research real-time systems for embedded software, while Luke finished drone side communication with integration testing with the android app will start this week.

- Nate
  - Did some research on real-time systems for embedded software
  - Discussed with Luke where to direct ourselves for our next steps
- Aamid
  - Obtained Data sheets for the flight control
  - Determined that flight controller will need to use MultiWii firmware instead of MegaPirate
  - Determined Language will be C/C++ within the flight controller
- Alex
  - Elicited limitations in the physical domain from mini-quad
    - Purchased mini quad off Amazon
    - Played around with the drone to observe how it acts in the physical space

        - Reduced rotor banks have a dual effect in lowering the downward thrust and thus losing altitude while executing the maneuver
        - A solution we are investigating is as we bank we increase the overall on all motors to counteract the thrust lost from redirecting the thrust while maintaining the ratio between the two sets to accomplish the bank
        - From the mini-quad discovered that banks buildup inertia that needs to be compensated for typical drone flight utilizes a quick jerking motion to counteract the inertia once the drone has reached its desire position
            - This will likely be an issue with our larger, heavier drone
            - The quick jerk solution is not ideal for our application
            - We are considering using a gentle bank and counter bank option which has the drone do a gentler bank to build up the momentum, return to a neutral hover, and then slightly banking in the opposite direction and back to neutral before it reaches its setpoint to counter the inertia and allow it to be in a steady state
    - Researched using ducts on the rotors as they increase lift in two manners while decreasing noise
        - As a rotor turns in pushes air down creating an area of low pressure above it and high pressure below it creating lift for the air frame
        - At the tips of the rotor, however, small vortexes form allowing some of the high pressure to bleed into the low pressure area decreasing the overall thrust
        - Additionally, if we curve the top of the duct where the air is taken it produces additional lift however this serves as a drawbacks as the additional lift acts as a self righting mechanism which will fight attempts to bank
        - A drawback to this addition is the additional weight so we'd need to make sure that the ducts' weight is offset by the additional thrust
        - Rotating in place (along the yaw axis) will be unaffected by ducts as it relies on the angular momentum of the rotors and reducing their counter action
    - Research myopic scheduling which is a scheduling algorithm for muli-processor systems
        - Provides predictable dynamic scheduling of tasks on resource bound, mutli-processor systems
        - Tasks are scheduled as non-preemptive meaning that once a task starts on the processor it will run to completion
- Luke
    - Drone communications able to receive commands and display them in prompt
    - Work with Nate to determine next steps for software
- Isaac
    - Send data out and receive them back on android studio

Planned to accomplish next week

- Luke
    - Integrate Drone Communications with other software components
        - When a command is received the drone software should update the state of the drone.

                - Add new target
                    - Upload an image of a target
                - Set target
                    - Set the target for the drone to follow
                - Arm drone
                    - Allow the drone's propellers to activate and the drone to take off
                - Disarm drone
                    - Disable to the drone's propellers to activate and drone should land or should not be able to take off.
            - Integrate these command responses with existing code.
- Nate
    - Find an operating system for real-time systems that supports python
    - Integrate the body detection with the facial recognition code
        - When a body is detected, attempt to detect a face
        - when a face is detected, check if it is the same face belonging to the intended target (ie the dancer)
- Aamid
    - Assemble Drone
    - Read Through Datasheets
        - Understand how the flight controller works
- Alex
    - Assemble Drone
    - Repair mini-drone
    - Continue research and maybe start prototyping myoptic scheduling
- Isaac
    - Get communication working from phone to pi
    - Begin decoding messages and help work on sending commands to the quadcopter

Roadblocks

- Items that prevented us from completing what was planned

Hours Spend

Team member	Hours This Week	Hours Total
Nate Allen	3	43
Alex Nicklaus	7.5	34
Luke Rohl	3	34
Mir Ahbab	1.5	24.5
Isaac	3	27