Sprint 6 Conclusion Meeting

Long Flight Time Buoyant Drone 4/26/2021 6:00 - TIME(PST)

horizontal lineATTENDEES

* Excused absences:
* Unexcused absences:

## AGENDA

* **Sprint progress:** 6:00
  + Leon: Struggling with code and compiling issues
    - Might try to write code instead of using libraries

6:03

* Jeremy: Figured out low pass filter for switching regulators
  + Should some power compared to linear regulators

6:04

* Dylan/Isaac: Almost finished with envelope, more string coming tomorrow and will be finished the same day
  + Printed ultrasonic mount, caused a jam in the printer
  + Getting it unjammed right now
  + Updated servo mounts with new dimensions Leon sent

6:05

* George: Height control added to the system, adjusts properly
  + Added remote control system that works with the pitch/roll/height regulator by combining them with the RC inputs

6:06

* Ryan: Digikey realized something is not right with shipment, contacted warehouse
  + Also working with the switching regulators and filters onto the PCB

6:08

* **Gantt Chart Updates:**
* Isaac: Sensor Simulation due 29th

6:10

* Leon: Electronic actuators implemented, marked as done
  + RC control almost done, raspberry pi needed to interact with receiver, will be done by 4/30

6:12

* George: Closed loop RC in matlab requires saturation numbers from the motors, 99% done, code generated by 4/27
  + Auxiliary autopilots functions designed, needs to code it into simulation

6:15

* Ryan: Fixing V1.9 PCB pushed to 5/4 due to shipping parts
  + Implementing switching regulators due 4/28

6:18

* Jeremy: Regulator choice has been finalized
  + Test power draw of motors and servos is waiting for the motor propellers and first PCB design

6:22

* Dylan: 3d printing fabrication is pushed back a couple of days due to printer issues
  + Also envelope sewing will be done by tomorrow
* **Review of Progress**: 6:30
  + Leon (110/140 hours) - 6:31
    - Implement servo control (10 hours)
      * Complete
      * Spent 20 hours due to change in servos
    - Implement ESC/motor control (10 hours)
      * Complete
      * Spent 10 hours
    - Implement remote control communication with Raspberry Pi (10 hours)
      * Incomplete, in progress
      * Had issues connecting to the receiver using receiver’s protocol
      * Spent 30 hours
      * Expected 4/30
    - Implement servo control with remote controller (10 hours)
      * Incomplete, in progress
      * PIC32 control of servos and motors completed, and communication between PIC32 and Raspberry Pi completed, but remote controller controlling servos not completed yet due to remote control communication with Raspberry Pi not being done yet
      * Spent 10 hours
      * Expected 4/30
    - Implement ESC/motor control with remote controller (10 hours)
      * Incomplete, in progress
      * PIC32 control of servos and motors completed, and communication between PIC32 and Raspberry Pi completed, but remote controller controlling motors not completed yet due to remote control communication with Raspberry Pi not being done yet
      * Spent 10 hours
      * Expected 4/30
    - Implement autonomous control data processing between PIC32 and Raspberry Pi (30 hours)
      * Incomplete, haven’t started yet due to not being done with remote control implementation
    - Implement servo control with autonomous control (10 hours)
      * Incomplete, haven’t started yet due to not being done with remote control implementation
    - Implement ESC/motor control with autonomous control (10 hours)
      * Incomplete, haven’t started yet due to not being done with remote control implementation
    - Group meetings (25 hours)
      * Complete
    - Sub-team meetings (15 hours)
      * Incomplete
      * Only 5 hours of meeting
  + Jeremy (123 hours) - 6:43 **(77/123 hours worked) + 9 hours on other tasks**
    - Verify PCB Design (4 hours)
      * Complete
    - Finalize Power Budget by double checking all parts and heat efficiencies (10 hours)
      * Complete
    - Optimize Battery once power budget is finalized (4 hours)
      * Complete
    - Group meetings (25 hours)
      * Complete
    - Sub-team meetings (15 hours)
      * Incomplete
      * Only 5 hours of meetings
    - Push ECE121 code to Github(1 hour)
      * Complete
    - Program C libraries for Linear algebra, integration, and other functions needed for controls (16 hours)
      * Incomplete:
      * 12 hours done on linear algebra
    - Program C libraries RC response (16 hours)
      * Complete
    - Program C Libraries for autonomous (16 hours)
      * Incomplete, in progress by George
    - Program C libraries automated landing and takeoff (16 hours)
      * Incomplete, found an alternative way for landing and takeoff
    - Other Tasks:
      * Low-pass filter implementation(5 hours)
      * Finalized voltage divider for receiver(4 hours)
  + Isaac (est. 152 hrs /**act. 129 hrs**) - 6:55
    - Implement Drag Force **(30 hours) - Complete**
      * Calculate Balloon Speed (10 hours)
      * Create 3D Drag Force (10 hours)
      * Apply Logic to Drag Force Given Balloon Speed (10 hours)
    - Implement Sensors to Read Pseudo Data from Vrep **(22 hours) - Complete**
      * Research Sensors (6 hours)
      * Implement Ultrasonic Sensor (4 hours)
      * Implement IMU (4 hours)
      * Implement GPS (4 hours)
      * Implement Balloon Barometer (4 hours)
    - Help Fabricate Prototype with Dylan **(30 hours) - Complete**
      * Sewing Envelope (20 hours)
      * 3D printing parts (10 hours)
    - Adding Noise to Sensors **(12 hours) - Incomplete/ In Progress**
    - Group meetings **(25 hours)**
    - Subteam meetings **(10 hours)**

Delayed due to Remote Control Sub-team Delays

* + - Implement Closed Loop Remote Control **(35 hours) - Incomplete**
      * Learn to Use Remote API to Apply C Code (15 hours)
      * Use Remote API or Rewrite C Code to Lua (10 hours)
      * Apply Outputs of Functions to Individual Parts (10 hours)
    - Implement Autonomous Design **(30 hours) - Incomplete**
      * Feed Sensor Input to Functions (10 hours)
      * Use Remote API or Rewrite C Code to Lua (10 hours)
      * Take Outputs and Apply Them to Individual Components   
        (10 hours)
  + Dylan (126 hours) - 6:59
    - Add updated parts to CAD (4/2) **(14 hours)**
      * Voltage Regulator (2 hours)
      * Camera and transmitter (4 hours)
      * Magaero housing (8 hours)
      * **All completed**
    - Fabricate Prototype (4/26) **(50 hours)**
      * Set up sewing machine and 3D printers (2 hours)
        + It took far more than 2 hours to complete closer to 10 hours.
      * Sew envelope (10 hours)
        + 90% complete waiting on more string to arrive tomorrow
        + Almost 30 hours spent on sewing and cutting (far underestimated time) should have probably been split into 3 10 hours tasks 2 of which are complete.for cutting sheets, cutting gore shapes, and an incomplete for sewing.
      * 3D print parts **(8 hours)**
        + **Issues with 3d printers caused delays in starting the printing process**
        + Servo brackets & plates (4 hours)
        + Ultrasonic mount & plate (1 hour)

**complete**

* + - * + Motor mounts (1 hour)
        + Gondola and plate (2 hours)
      * **All other tasks blocked by 3d printing and PCB not being ready**
      * Attach 3D printed parts to envelope (5 hours)
      * Inflation test of lift bag inside envelope with air (5 hours)
      * Attach servo and motor shafts to brackets (4 hours)
      * Add ultrasonics to bracket (1 hour)
      * Add electronics to gondola (5 hours)
      * Wire prototype (10 hours)
      * Second Inflation test of lift bag inside envelope with air (5 hours)
    - Implement Sensors to Read Pseudo Data from Vrep **(22 hours)**
      * Research Sensors (6 hours)
      * Implement Ultrasonic Sensor (4 hours)
      * Implement IMU (4 hours)
      * Implement Gps (4 hours)
      * Implement Balloon Barometer (4 hours)
      * **All complete**
    - Group meetings (25 hours)
    - Subteam meetings (10 hours)
  + George (140 hours) - 7:02. Spent 164
    - Complete path following terrain tracking PID design (10 hours)
      * Incomplete. 50 hours spent. Current design approach is impractical to implement and needs a matrix and controls redefinition. This was a failure where I chose an abstraction approach when i shouldnt used abstraction to start and build up from auxiliary functions.
      * Also decided Closed Loop RC is more important for testing and should be completed first.
      * Currently scrapping the current design since the new approach, that has been used to define closed loop and auxiliary functions, is far faster and allows me more control in the design.
    - Simulate Path following terrain tracking in Matlab (10 hours)
      * Delayed since PID autonomous design not completed
    - Define plant for closed loop RC (5 hours)
      * Complete. Spent about 20 hours redefining matrices and analyzing approximations. Resulted in using a mix of polar and XYZ coordinates. Estimations are better defined and justified and much easier to work with.
      * Also new definitions assisted in applying pole placement with integral implementations that we will be using for the rest of controls.
    - Pole placement and integral control added to RC design (15 hours)
      * Complete. Far superior approach that was built off of auxiliary functions. Will use the same method for the rest of controls. Spent approximately 15 hours. (Current design also includes height control) Current design works by calculating motor forces after the pith/roll/height regulator has already issued commands, so that the RC response does not interfere with stability of the drone.
    - Simulate RC response in Matlab (5 hours)
      * Complete. Response has been tested by analyzing physical response and motor commands based on user input. Appears to be ready to export to VREP simulation. Approximately 5 hours spent.
    - Design filters to obtain accurate state data (25-30 hours) will be Broken down when filter design chosen after further research
      * Task 1: Complementary filter for calculating pitch roll angles designed. Spent approximately 7 hours.
      * Task 2: Estimation of height was not completed, only high level design. Spent approximately 10 hours.
      * Task 3: Filter for ultrasonics for object avoidance not yet developed.
      * Task 4: GPS filter not yet designed
    - Simulate and test noisy sensor model (10 hours)
      * Task 1: Filter for pitch and roll tested only, approximately 2 hours.
      * Task 2: Rest of noisy sensors and filters not tested since not yet developed.
    - Auto landing function (10 hours)
      * Complete: Design is complete and ready to be exported into Vrep.
      * Spent approximately 10 hours
    - Auto take off function (10 hours)
      * Complete: Design is complete and ready to be exported into Vrep.
      * Essentially the same function as auto landing. No time spent.
    - Meetings (35 hours)
      * Spent more than 35 hours with a few smaller meetings for other functions. Approximately 40 hours.
  + Ryan (122 hours) - 7:07
    - Finalize BOM PCB parts (2 hours)
      * Complete
    - Wiring data bus between sensors to microcontroller in board design (3 hours)
      * Complete
    - Wiring voltage rails to all components (4 hours)
      * Complete
    - Wiring microprocessor to microcontroller, receiver and pinouts for servos and ESC (3 hours)
      * Complete
    - Verify PCB with power management (4 hours)
      * Complete
    - Send out PCB design to manufacturing (1 hour)
      * Complete
    - Remove ECE 121 repo within Barone2 repo and re-upload ECE121 C programming code to Barone2 repo (1 hour)
      * Complete
    - Program C libraries for Linear algebra, integration, and other functions needed for controls (16 hours)
      * Incomplete, working on fixing voltage rails, rearranging sensors and microcontroller away from voltage rails.
    - Program C libraries RC response (16 hours)
      * Complete
    - Program C Libraries for autonomous (16 hours)
      * Incomplete, in progress by George
    - Program C libraries automated landing and takeoff (16 hours)
      * Incomplete, found an alternative way for landing and takeoff
    - Group meetings (25 hours)
    - Sub-team meetings (15 hours)
      * Incomplete
      * Only 5 hours of meetings
* **Team Improvements**: 7:12
  + Sprint should have been shorter so goals could have been adjusted
  + Got better at working together within sub-groups
  + Task time was estimated very incorrectly
* **Individual Improvements: 7:16**
  + Dylan- 7:16
    - Over confident (especially related to 3D printing
    - Need to stop assuming things will go as planned (leaving more room for error)
    - Will need more help going forward, much of fabrication is at least a 2 person job
  + George- 7:18
    - Should be less stubborn with trying to make tasks work. PID autonomous severely delayed controls progress, should have changed approach earlier.
  + Isaac- 7:19
    - Start work earlier in the day and manage my time more effectively
    - Ask for help outside of team meetings
    - Give more input during team meetings
  + Jeremy- 7:20
    - Needs to ask other team members if they need help more often when tasks are getting stuck behind others
    - Clearly define tasks better or what needs to be worked on that are not exactly tasks
  + Ryan- 7:21
    - Ask for help on C programming tasks when I don’t understand
    - Be proactive about asking other team members if they need help
  + Leon- 7:22
    - Spent too much time on beginning of tasks and didn’t get around to future tasks
    - Need more optimized daily routine
* **Next Goals**: 7:23
  + Dylan- 7:24
    - Finish 3D printing, related tasks
      * Print parts attach parts to envelope
    - Help out with other tasks for sensors coding and simulation while I wait for hardware to be ready to add to prototype
    - Test prototype once electronics and remote control are ready
    - Get helium
  + George- 7:25
    - Design autonomous Controls
    - Tuning for all systems
    - Design rest of sensor filters
    - Assist with manufacturing
  + Isaac- 7:26
    - Complete prototype fabrication
    - Add closed loop control to simulation
      * Find out how to convert C to Lua
      * Edit code to fit V-rep
  + Jeremy- 7:27
    - See how correct motor and servo estimations were with actual testing with Leon
    - Assist other team members with coding
  + Ryan- 7:28
    - Get started on V2.0 PCB and fix all issues with V1.9 board when its working
    - Ask to help other team members when I have time
  + Leon- 7:29
    - Finish up remote control implementation
    - Put together first PCB board with all parts and test hardware as fast as possible to find bugs
    - Start autonomous control implementation, at least create a structure to just plug in numbers for when autonomous control design is finished
  + Team Goals
    - Report writing-
    - Put together complete drone
    - Attempt first drone flight
* **Other Business**- 7:30
  + Final report should be started by each team member over the course of this week
  + Sprint report should be started by Wednesday, and submit it by Friday
  + Next sprint will be started sometime this week

Meeting End: 7:35