MEAM 620 Project 1 Phase 4

Due: Friday, March 14, 2014 *(Tentative)*

For this assignment, you will work as a team to implement on a controller and trajectory generation using the KMel Nano+ quadrotor platform and software developed by KMel Robotics [1].

You will need to sign up online for times to fly at the website posted on Piazza. Due to limited space in the lab, one group at a time will be allowed to use the equipment for testing under the supervision of a TA.

Please see Lab Manual for the detailed instructions on using the hardware and software. The handout will describe the assignment and submission procedures.

1 Minor differences in Startup Procedure

1. You don't need to open 4 tabs manually. Simply run `StartExp.sh` on the terminal will open everything you needed.
2. You shouldn't need to change anything in `init_exp.m`. We have setup a list of `init_exp` script for each Nano+ already. Hence, you simply need to put in the right number in `mainQC.m`
3. When the high level Matlab is opened, you can run `SetUpExp.m` to open all files you needed for flying the quadrotor.
4. You will be using `send_seqmsgLandOnCube.m` instead of `send_seqmsgLand.m` for this project.

2 Assignment

Your task for this phase will be to implement a controller and trajectory generation of your choosing and integrate it with the Matlab base of code from KMel. As a group you will need to complete the scripts listed below and demonstrate that your control works to a TA. All scripts will be located in the `/home/meam620/studentcode` folder of your student account on the mac mini. You are welcome to create additional files as needed to organize your scripts - just keep all of your work in your folder.

1. Complete the scripts `student_control_hover.m` and `send_seqmsgHover.m`. This should be a controller capable of stabilizing your quadrotor in hover and the corresponding high level message to initiate the controller. Have a TA check that they witnessed succesful hovering.
2. Complete the scripts `student_control_waypt.m` and `send_seqmsgGoToWaypoint.m`. This should be a controller capable of sending your quadrotor to a waypoint specified in the corresponding message. Your path between the waypoints for this step should be a line but the velocity profile is up to you. Have a TA check that they witnessed succesful transition to a different waypoint.
3. Complete the scripts `student_control_multi_waypt.m` and `send_seqmsgFollowWaypoints.m`. This should be a controller capable of sending a quadrotor along a path defined by a series of waypoints sent in the corresponding message. Waypoints for this task will be loaded into the high level matlab process using a .mat file. Some example files are in the folder `~/matlab/example_waypoints`. Have a TA check that they witnessed successful completion of a path.

You are welcome to use the same control equations for each part, if you have a controller that will work for all tasks.

3 Submission

There are three deliverables for this assignment:

1. **Group Report**: Each group should submit a report approximately five pages in length (including plots - you don't need five pages of pure text) containing the following information:

    1. A description of any controller that you used, including equations, and the actual gains you used.
    2. A description of your trajectory generation for waypoint following, including equations if relevant.
    3. Plots of the actual vs desired position of the quadrotor for all three tasks. Make sure to label your axes and provide multiple views in order to translate the 3D information to the 2D paper.
    4. A link to the video proving the completion of your tasks.

    The report should be a pdf and should be sent to meam620@gmail.com.

2. **Individual "Report"**: Each person should send a one paragraph email to meam620@gmail.com with their name and group number and a short description of what they personally did for the group, and a short description of the contributions of their teammates.

3. **Code** : A .zip file of all code that you used for this phase. Send this with the report.

References

[1] KMel Robotics, http://kmelrobotics.com/