NAKUJA PROJECT PROGRESS REPORT INTERNSHIP 2022 WEEK 7

FLIGHT CONTROL

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TASKS LAST WEEK

- [#101] Fabrication of the reaction wheel mounting case.
- [#29] Log operation data.
- [#25] Test reaction Wheel on test bench with current firmware.
- Creating interfaces to hide implementation details, make for easier following, debugging and library changes.

[#101] Fabrication of the reaction wheel mounting case.

[#25] Test reaction Wheel on test bench with current firmware.

- Testing done, and data logged.
- PID tuning ongoing.

Options:

- Ziegler Nichols method tried.

KP = 0.6*Ku

Ti = Tu/2;

Td = Tu/8;

Ku = ultimate gain for neutral stability.

Tu = period of oscillation at neutral stability.

Ki = Kp/Ti

Kd = Kp*Td

These can be set from a lookup table for different controller requirements (No overshoot, PD, PI, classical PID).

- Root locus of the mathematical model.
- Trial and error method on Matlab with Simulink blocks.

- Performance not verified because ESC needs recalibration.

  Full_forward = 1832;

  Neutral = 1488;

  Full_reverse = 1312;

[#29] Log operation data.

- Data logged is yaw, pitch, roll, PID output and PWM values.
- PID output scaled from 0-255, scaled to PWM values for ESC by map

  pwm = map(Output, 0, 255, 1488, 1832)
- Relogging after ESC recalibration.
- ASIDE: Future work on implementing and using cyclic FIFO buffer to ensure no data loss during times SD is still being written to.

TASKS THIS WEEK

- Static Test

TIMELINE

Timeline

Month	Week	Tasks
January	Week1	Familiarising with the N1/N2 project Soldering of prototype flight control PCB Research on the design of reaction wheel
	Week2	Design of the N2 reaction wheel Logging of data onto the SD card
February	**Week1**	Design of the mounting case and safety cage of the reaction wheel
	Week2	Research on Kalman Filter and ways to improve it
	Week3	Libraries overhaul and reimplementation.