GNC Quad Chart

November 13 2024

State transition diagram:

$$|h_{ref} - h| \leq tresh$$

$$|\hat{s} - I_{max}| \leq tresh$$

DETUMBLING/ SPIN-STABILIZATION → **SUN POINTING** → **NOMINAL**

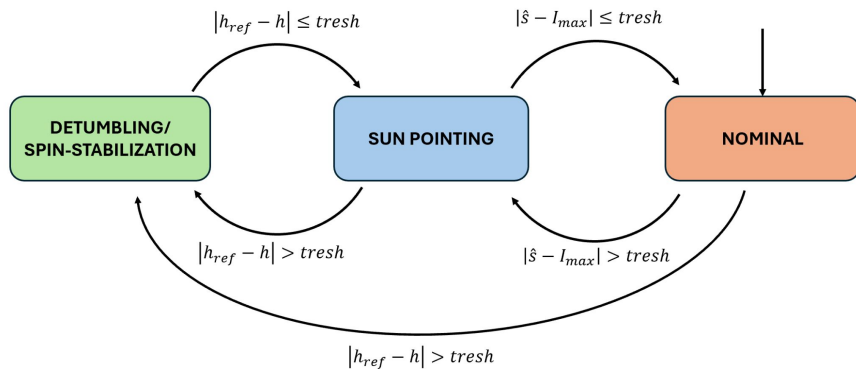$$|h_{ref} - h| > tresh$$

$$|\hat{s} - I_{max}| > tresh$$

$$|h_{ref} - h| > tresh$$

Blockers:

Landsat mosaics used by Vinsat codebase

Progress:

Simulation:
- C++ sim integrated into FSW (some minor changes pending)
- OD: vision model running*, working on integrating Vinsat image generation
- Sensor models added to C++ sim

Mode management:
- Argus-1 GNC MM draft

Attitude EKF:
- Preliminary results, need to do much more analysis.

Plan for the Upcoming Week:
1. Supporting parameter dispersion for MC analysis into C++ sim
2. Implement magnetorquer controllers and begin rudimentary hardware testing

Interfaces:

- Vision:
    - Difficulty running region classifier model
    - Motion blur angular velocity threshold

Kanban

Backlog 8 (Estimate: 120)
This item hasn't been started

GNC-Simulation #14
Pointing Error Budget

Draft
Enumerate mission scenarios and modes

GNC-Simulation #11
Magnetorquer sizing
100

Draft
Test OpenMV startracker camera in schenley park

Draft
Evaluate NASA COTS Startracker software

Draft
Solar Array Study
20

Draft
Investigate off-gassing properties of hard drive platters

Draft
Look into Optical-Flow-Based Landmark Outlier Rejection for Successive Images

+ Add item

Ready 5 (Estimate: 0)
This is ready to be picked up

GNC-Simulation #32
Multiplicative EKF for Attitude Implementation
P1 M

GNC-Simulation #28
Sim SRP: Shadow function for SRP acceleration
P2 S

GNC-Simulation #29
Sim Gravity: Harmonic gravity (if required)
P2 S

Draft
Bootstrap STM32-based BLDC Controller Board

reactionwheel_firmware #2
Integrate A55048B SPI Encoder

+ Add item

In progress 7 / 6 (Estimate: 200)
This is actively being worked on

GNC-Simulation #17
Star Tracker Camera Spec-ing Analysis
P0 100

GNC-Simulation #10
PNP-Based Orbit Determination Implementation
P1 100 M

GNC-Simulation #9
RW Sizing
P1 M

Draft
Study Pixel Truncation Error's Impact on Orbit Determination

GNC-Simulation #16
Orbit Determination Debugging

Draft
RW Sizing: implement more complex model in sim

Draft
Passing Controllers to C++ Sim

+ Add item

In review 4 / 5 (Estimate: 0)
This item is in review

GNC-Simulation #38
Modify Sim interface to work with SIL
P0 M

GNC-Simulation #18
Solar Power Generation Model
P1 S

Draft
Implement Spin-stabilized scenario

Draft
Spin Stabilized Lyapunov Attitude Controller

+ Add item

Done 12 (Estimate: 20)
This has been completed

GNC-Simulation #31
C++ Core simulation integration
P0 XL

reactionwheel_firmware #1
Integrate Magnetic Encoder
P1 M

GNC-Simulation #23
Sim ground track plot convert position from ECI to GEOD
P1 XS

GNC-Simulation #12
Core Sim Performance
P1 S

GNC-Simulation #27
Sim C++ bindings: look into pass-by-reference to avoid eigen copies
P1 S

GNC-Simulation #26
Disperse initial orbit/position/velocity
P1 S

GNC-Simulation #22
Compute geodetic coordinates from ECI
P1 XS

GNC-Simulation #35
Visualize ground track in ECEF

GNC-Simulation #36
Support dispersing sim parameters for MC analysis

GNC-Simulation #15
Orbit Determination

+ Add item