ADCS:

Attitude Determination and Control System

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Updated beginning of -semester goals

Period	Tasks and goals
Start of the Semester	• SIL Testings ➢ Albedo Effect (Manual Compensation for the albedo in the photodiode readings) ➢ TLE reset discontinuity in orbital state • HIL Testings ➢ Get HIL simulations running (for a period of time chosen by the user) ➢ Viability study of implementing new features in HIL simulations (TLE reset, switching modes etc.) • "A Guide to MIST's ADCS Team" • Familiarizsation of new ADCS recruits (Filippo, Ali, Emre, Roque) • Future tasks: Magnetometer Calibration and Controller Tuning

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Familiarization of new ADCS recruits

A Guide to MIST's ADCS Team

MIST (MIniature STudent Satellite Project)

Lucas Barbero Sánchez
Ramon Albareda Montenegro

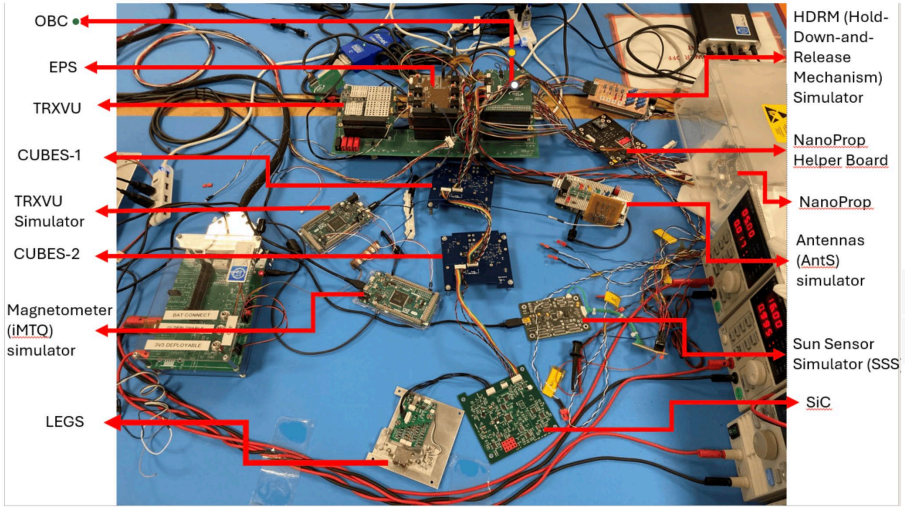
September 2024

Contents

On-Board Plan for new ADCS members in MIST	
Week 1	Read a "Guide to MIST's ADCS team and install all the software specified. Read last version of MIST management plan and the folder 1-MIST in the wiki for an introduction to the project. If you want to know more about MIST you can always read the project overview in MIST's website.
Week 2	Look through all the code and run a simulation in your computer. Plot the results using Matlab and the scrip sim_results.m or quat_EST_SIM_NG.m inside the folder matlab-utils
Week 3	Delve into the details of the code and run simulations changing the ADCS modes, the ADCS parameters and the TLE (see file TLE_Reset_Epoch.m) at a specific simulation time
Week 4	Perform a HardWare in the loop simulation with a duration of 5 minutes in the Mist Lab. Plot the results of the HIL simulation.
Week 5	This is an extra week so that you invest in whatever you feels you need more time on. This can range from reading papers regarding ADCS, reading pevious work in MIST, exploring MIST_Cloud or the wiki...

Familiarization of new ADCS recruits

Roque/Emre → Magnetometer Calibration
Ali/Filippo → Controller Tuning



FlatSat status as of 2025-02-18.

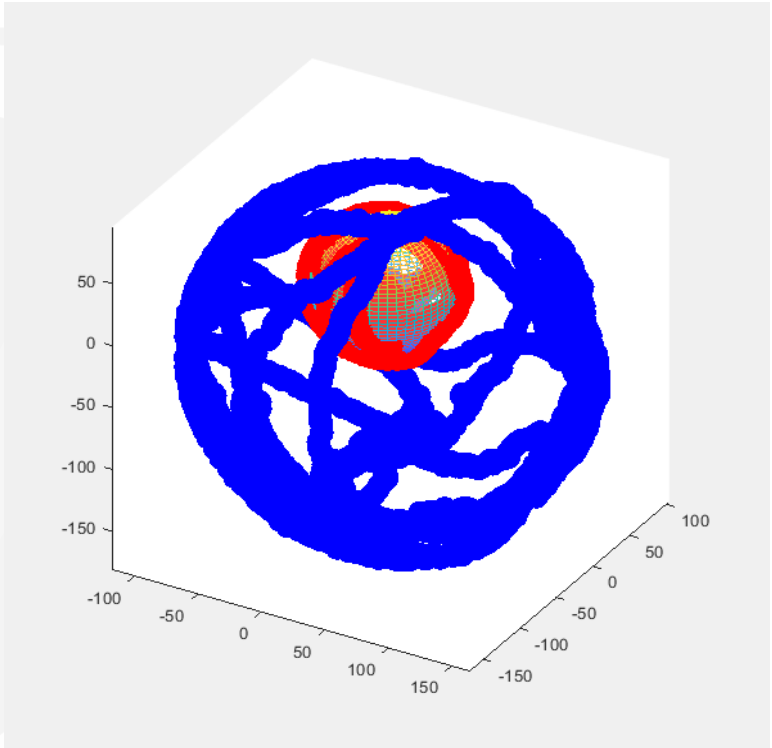
Alexander
Cezary
Ginnie
→ Magnetometer Calibration/Controller Tuning

Magnetometer calibration

- Simulation code done by previous students is working as expected.
- Two calibration algorithms already done.
- Least square ellipsoidal fitting and Newton -Gauss nonlinear least square fitting.
- After reading some papers the Least square ellipsoidal fitting will be chosen, due to more robust modeling in real world conditions.
- Newton-Gauss does not offer a complete correction matrix with soft ferromagnetic corrections (like from nearby fields).
- Newton-Gauss will be kept as a backup option in case ellipsoidal fitting does not work for some reason in practice.

Magnetometer calibration

- Results from test run of the already done simulation code.
- Sphere is true field values.
- Red is calibrated measurements.
- Blue is initial measurements (without correction).

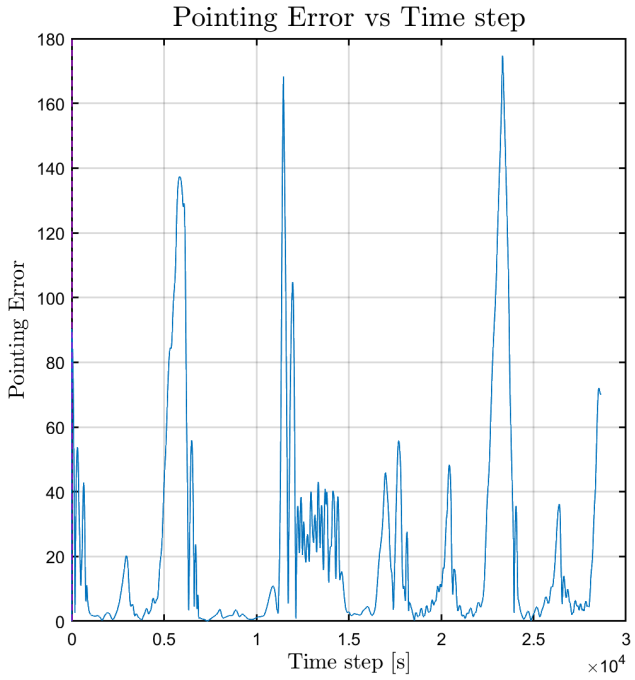


Magnetometer calibration

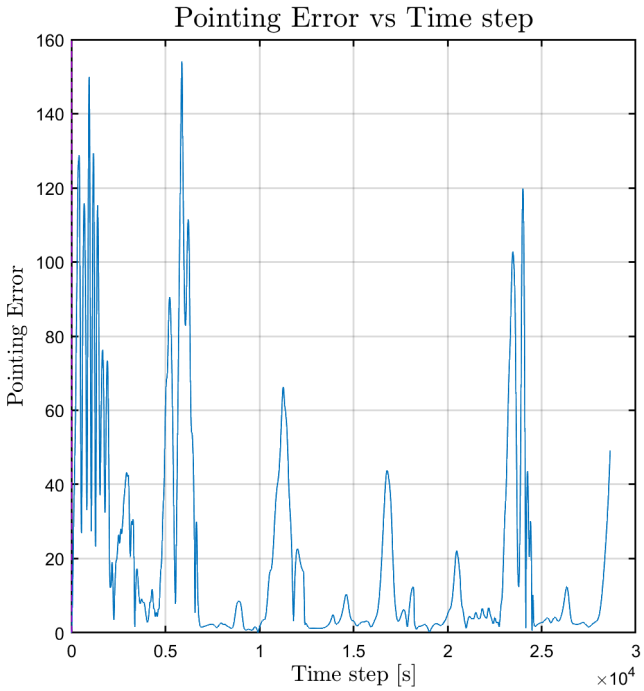
- Left to do in the calibration:
- Find an experimental setup to do the actual calibration with the real magnetometer. (This is more or less given in one of the papers).
- Do the actual calibration.
- Analyze the results and implement them.

Controller Tuning

Current results (without tuning)



Current results (with previously found tuned parameters) and launchdate starting at 0 seconds



Controller Tuning

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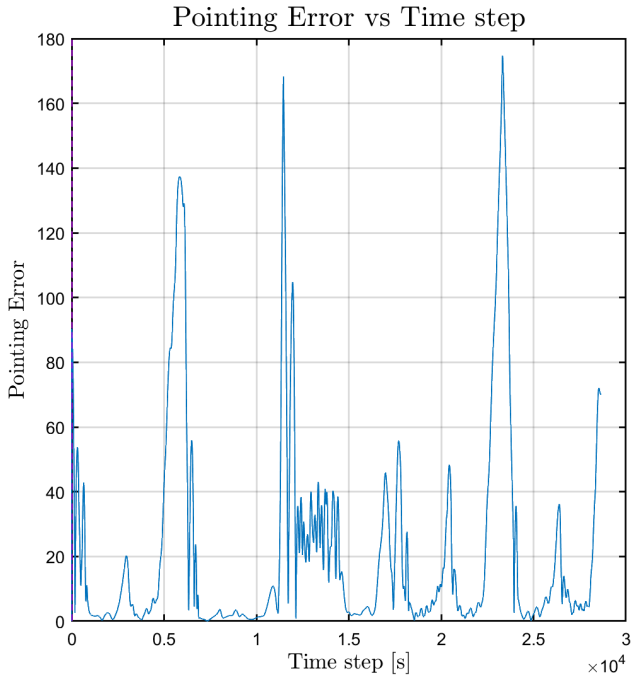
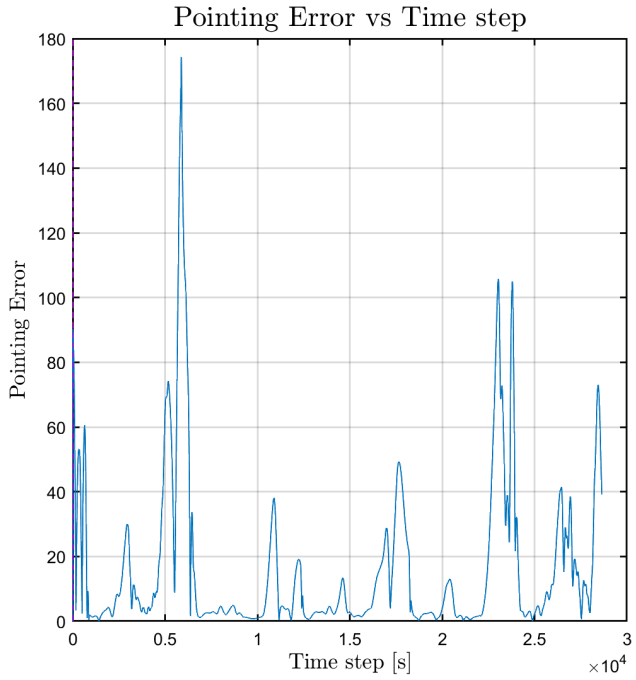
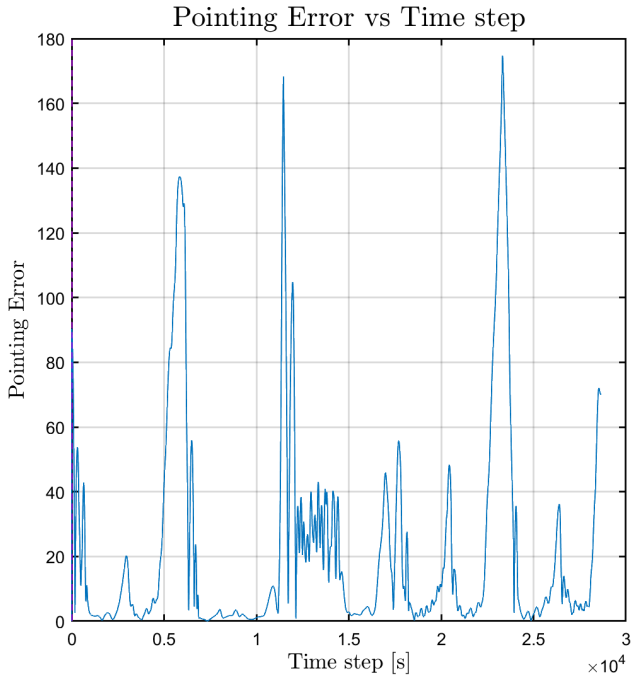


Current results (with previously found tuned parameters) and launchdate starting at 0.02 seconds

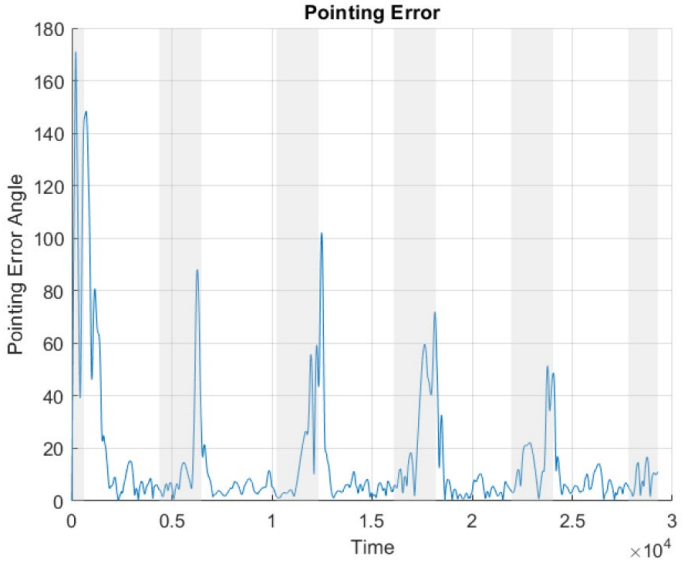


Controller Tuning

Current results (without tuning)



Expected results (after tuning)



Questions?

Thank you for your attention