Group 2

Open Source Virtual Satellite

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Self-introduction

- Assistant professor of Prof. Nakasuka’s lab.
- Several experiments on micro-spacecraft development and operation
  - Attitude control, C&DH, Science instruments...
  - Software development for spacecraft

- PRISM (2009): 8kg Remote Sensing
- Nano-JASMINE: 33kg Astrometry
- PROCYON (2014): 65kg DeepSpace Exploration
- EQUULEUS (2019): 14kg Lunar Exploration
Issues on current nano-satellite development

- Hardware First
- Many **standardized** and **modularized** H/W components, but no S/W components.
- Many software bugs
  - We need more evaluation or hands-on training opportunities on S/W development
- Real H/W components are still expensive
  - Opportunity to access space is still limited

We have to more focus on S/W development, standardization, modularization, education, and reliability
My dream

- I want to develop, evaluate, and demonstrate every S/W related to space activity in a virtual space in PC
  - Every S/W: On-board C&DH, ADCS, Thermal, Power etc...
    - On-ground C&DH, image processing, etc...
- The virtual space **must seamlessly connect with real hardware components**
Open Source Virtual Satellite

Method
  Sub objective

Peer review

Modularization

Standardization

Main objective
  Efficient and Effective R&D
  Education
  Reuse

Reliability of developed S/W

Experience of virtual satellite operation
My Dream: Virtual Satellite

- Spacecraft
  - Algorithms
  - Components Emulator
- RF & Antenna Emulator
- Algorithms
- Ground Station
- Simulator
  - Space Environment
Why Open Source? Why in UNISEC?

- The dream is **too huge** to achieve by one researcher, one laboratory, and one country
  - I need collaboration with many **motivated people** all over the world
- The virtual space is useful for **all satellite developers**, especially for university **researchers and students**
  - Experts: Reliable and efficient development
  - Beginners: Low cost but effective training

The project is suitable for concept of UNISEC-Global
Open Source Virtual Satellite

- Efficient and Effective R&D
- Standardization
- Modularization
- Reuse
- Education
- Experience of virtual satellite operation

Diagram:
- Spacecraft
- Algorithms
- Components
- Simulator
- Space Environment
- RF & Antenna
- Algorithms
- Ground Station
Agenda of our group

- What kind of functions do we need?
  - For beginners, for experts,
  - For education, for reliability, and for efficiency

- How to build a team for this project?
  - What kind of team members and tools do we need?

- What can we do as a first step of this mighty project?