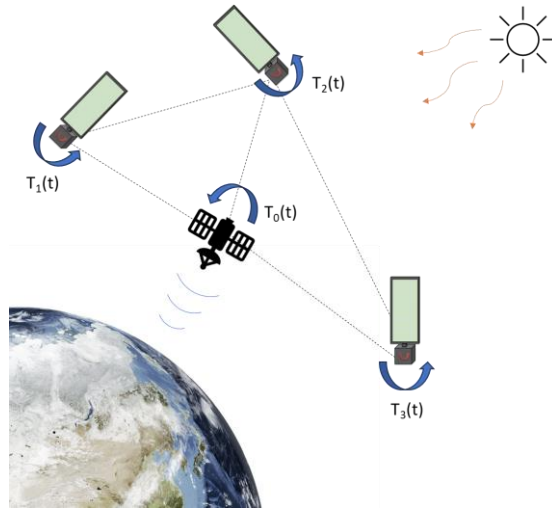


Distributed Attitude and Trajectory Control for a Space-Based Solar Power System



Distributed Space-Based Solar Power (SBSP) Concept

Problem Statement

- Space-based solar power (SBSP) is a concept for collecting solar energy in space and beaming it to Earth.
- This proposed project aims to **develop coordinated attitude and trajectory control strategies** for a formation of power-collection satellites, which operate around a power-beaming satellite.
- Project objectives:
 - ❑ Mathematically define the SBSP cooperative control problem, including system dynamics, objective function, and constraints
 - ❑ Select a formation control strategy and perform initial testing and simulation using MATLAB and GPOPS-II
 - ❑ Use ROS/Gazebo for validated, physics-based simulation and visualization
 - ❑ Use the Floating Spacecraft Simulators (FSS) available at the Space Robotics Laboratory (SRL) for hardware-in-the-loop testing

Impact

- Key benefits of a distributed SBSP system include:
 - ❑ **Scalability:** can add more deputy satellites over time for more power
 - ❑ **Resilience:** if one deputy fails, the whole mission does not fail
 - ❑ **Modular upgradability:** new chaser satellites with improved technology can be added over time
- Multi-spacecraft SBSP is a new concept, so the proposed project will advance our understanding of
 - ❑ control costs for operating the mission
 - ❑ feasible operating orbits and formation constraints
 - ❑ expected power as a function of satellite size and formation scale
 - ❑ advantages and disadvantages of the distributed SBSP concept
- At NPS, this project aims to attract 2 NPS student officers for this research

Transition

- Previous and ongoing research on dynamic modeling and vibration control of one SBSP satellite is funded by AFRL-RV
- This project aims to maintain a close relationship with the AFRL SSPIDR program and make contact with other potential DOD transition partners, such as the DARPA POWER program
- This project will explore possible collaboration opportunities with NASA to fly a technology demonstration experiment on the International Space Station

Videos of preliminary Gazebo modeling

www.youtube.com/watch?v=F8r7CiOs200

www.youtube.com/watch?v=NA9wQbCycUc