Potential Scheduling Applications to the Tracking of the GNSS Constellation

Christopher Clarke

Julie Horvath

NASA SLRProgram

Honeywell Technology Solutions Inc.

Honeywell International

7515 Mission Drive

Lanham, MD 20706 USA

E:mail: christopher.clarke@honeywell-tsi.com

E:mail: julie.horvath@honeywell-tsi.com

Introduction

- GNSS constellation has many overlapping passes.
- GNSS constellation is currently scheduled according to static priorities. Same priorities may be interleaved.
- The NASA SLR mission scheduling software has addition features that may be utilized.
  - Amount of recently tracked data (by a station or group of stations) may be included the scheduling criteria.
  - Satellite position may be included in the scheduling criteria.

Previous Tracked Data Optimization

- Priority of satellite may raised if the less than *x* normal points have been tracked in the previous *y* hours or days of tracking.
- Priority of satellite may lowered if the more than *x* normal points have been tracked in the previous *y* hours or days of tracking.
- The number normal points may be determined from an individual station or a group of stations associated with that station.

Examples of Previously Tracked Data Optimization

- If Moblas-7 had tracked less than 10 Glonass-102 normal points in the previous week than the priority of Glonass-102 would be raised above the other Glonass satellites.
- If the North American stations had tracked more than 40 Glonass-102 normal points in the previous week than the priority of would be lowered below the other Glonass satellite for Moblas-7

Satellite Position Optimization

- AOS/PCA/LOS Optimization
- Sky Coverage Optimization
- Ascending Descending Optimization
- High Elevation Optimization

AOS/PCA/LOS Optimization

- Change the priority of satellite at the AOS/ PCA/LOS of a pass.
- Separate parameters can set for each of the AOS/PCA/LOS of a pass.
- Priority will be change for *x* minutes after AOS, *z* minutes at PCA, and *y* minutes before PCA.

Sky Coverage Optimization

- Divides sky into sections based on azimuth and elevation.
- Calculates amount of time satellite has been tracked in a section of the sky.
- Raises the priority of a satellite in a particular sky section where the amount of satellite data not reached the minimum threshold.

Sky Coverage Optimization

- Divides sky into sections based on azimuth and elevation.
- Calculates amount of time satellite has been tracked in a section of the sky.
- Raises the priority of a satellite in a particular sky section where the amount of satellite data not reached the minimum threshold.

High Elevation Optimization

- The priority of satellite can be change above a certain elevation.

Ascending/Descending Optimization

- Calculates the number of points a satellite has been tracked in ascending and descending nodes.
- Raises the priority of a satellite when the satellite is in an ascending or descending node and the amount a satellite has been tracked in that node is less than the minimum number of normal points.

Summary File Information

- Information included.
  - Total number of passes and minutes each satellite is available versus number of passes and minutes which the satellite is scheduled.
  - Separated by ascending / descending node and section of the sky.
  - Effects of the optimization.
    - The schedule will be generated with and without the optimization applied, then the net effects of the optimization will be calculated and output.

Summary

- GNSS constellation has many overlapping pass.
- The NASA SLR mission scheduling software has addition features that may be utilized.
  - Amount of recently tracked data (by a station or group of stations) may be included the scheduling criteria.
  - Satellite position may be included in the scheduling criteria.
- Need scheduling criteria and parameters to be defined by MWG ad AWG