GPS Data Filter Design Model

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Content

The following diagram is a class diagram for the three main types of data filters added to the Orbit Determination Tool Box for Release 4.5 as part of the GPS Enhancements. The three main types of data filters are to:

- Filter GPS measurement data (based on GPS SV PRN, block type, a C/No threshold, by explicit times, by a time window, or by multiple filters combined together),
- Filter GPS physical parameter data based on an elevation angle or by explicit times,
- Filter estimated C/No by a threshold.

The GPS measurement data and physical parameter filters follow a Template Design Pattern where abstract base classes, FilterGpsData and FilterPpData, form the bases of their class hierarchies. Each derived/concrete filter class is intended to be a function object where the filter is applied to data but the data inputs and results are not stored in these classes.

The FilterGpsMulti follows the Composite Design Pattern where it is used as a single filter instance but it implements the behavior of multiple filters that derive from FilterGpsData.

The FilterPpData class hierarchy is separate from FilterGpsData. However, FilterPpData makes use of several types of FilterGpsData filters in order to properly filter any GPS measurement data that needs to be coordinated with filtering physical parameters.

Likewise, FilterEstCnoThresh is not part of these other two class hierarchies. However, it can make use of the FilterPpExplicitTimes if it needs to coordinate the filtering of physical parameter data with the estimated C/No data.

Logical design extension points are the following:

- More types of FilterGpsData and FilterPpData derived classes can be implemented to sort by various criteria. The derived classes should only need to implement the getInd() methods.
- The FilterPpData hierarchy could be augmented with a composite class, similar to FilterGpsMulti.