

ABSTRACT

For 2007 IEE Aerospace Conference

Modeling Relationships using Graph State Variables

The Mission Data System is a unified flight, ground, simulation, and test software system for space missions. Its first application will be the Mars '07 mission, where common MDS software frameworks will be adapted for use in interplanetary cruise, entry-descent-landing, and rover operations. A key architectural theme of MDS is that state and models are the foundation for estimation, control, command, and data analysis. Certain essential states (e.g. attitude and position) are best defined as relationships between nodes in a graph. This paper describes a general directed graph based state representation that (1) derives a state's value by combining relationships, (2) produces different results for different derivation paths, (3) handles changes to topology and relationships between nodes, and (4) represents dependencies between relationships (e.g. correlations). In addition, this paper shows example GSV representations for orientations, trajectories, articulated elements, and time frames.