Internet-Accessed Data Transforms an Approximate Computer Simulation of a Spacecraft into a Verified 3D Model

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The Mission of Goddard Space Flight Center Includes Monitoring Unmanned Spacecrafts

At the Goddard Space Flight Center, personnel work to develop, build, and maintain unmanned spacecraft for NASA's various research missions. Among the many tasks involved in this process is the monitoring of spacecraft after launch.

It is Now Possible to Monitor Spacecrafts Practically All the Time

Until recently, the monitoring of a spacecraft after launch was a difficult task, limited to small periods of time in the day when the spacecraft entered the communication period of its orbit. Now with the placement of NASA's Tracking and Data Relay Satellite System, spacecraft communication is available practically all the time, allowing personnel to monitor the spacecraft more continuously.

Currently, Monitoring is Cryptic

At present, the existing communication allowed only the monitoring of the spacecraft by providing numerical data, which still had to be interpreted by trained personnel. A natural idea is to to provide a *picture* of what this numerical data represents.

The Existing 3D Model is Only Approximate

At present, there exist 3D computer models of the spacecrafts. These models provide accurate, to-scale representation of unmanned spacecrafts. One can zoom on them and get a clear picture of the position of solar arrays, antennas, etc., or zoom out and get a larger picture of the spacecraft's position with respect to Earth.

However, these models are only approximate and they did not give the *verified* information about the spacecraft, only the simulated one. The main reason is that in general, the flow of telemetry information coming from the spacecraft is so huge that the computers that actually receive and process this telemetry information have no resources left for such a resource-consuming task as 3D modeling. Therefore, currently, 3D modeling is done on stand-alone computers, with simulated data instead of the actual measurement results.

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To transform the approximate computer simulation into a *verified* model, we must get the necessary data from the main spacecraft-monitoring computer. In this talk, I will describe how I arranged the communications between a 3D computer model of a spacecraft and a spacecraft monitoring ground station that enables the model to obtain real orbital data for use in depicting the spacecraft orbit, and thus, how the resulting 3D model became verified.

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