SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
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A UNIFIED DESIGN OF THE RANGING AND TELEMETRY IN SPACE EXPLORATION

Abstract

A new two way ranging architecture which downlink signal is unified design with telemetry is proposed in this paper. The scheme designs a new style uplink signal that the ranging signal is modulated by the framing data. And the downlink ranging signal is combined with the telemetry signal in order to reduce the complexity of the downlink channel and make the full use of the constraint power of the spacecraft. The conventional transparent transferring ranging signal is replaced by the downlink telemetry signal. The back edge of the uplink ranging signal's frame synchronization is exactly corresponding with the front edge of the telemetry signal's frame synchronization. The length of the uplink ranging frame synchronization is fixed. The telemetry signal is received on the ground and the round-trip light-time can be computed by subtracting the uplink frame synchronization. The advantages of the system include the ability to reduce the complexity of the downlink channel by combined the ranging with the telemetry, the higher performance of the telemetry by make the full use of the downlink power of the spacecraft. Especially in the deep space exploration, this system can achieve desired performance.