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TWIN SATELLITE MISSION TO L4 AND L5 FOR MARS COMMUNICATION

Abstract

Missions for human exploration on Mars are planned by various space agencies like NASA and SpaceX. Communicating with the crew members is crucial for every mission. The communication time delay between Earth and Mars is about 20 minutes. Once in every 26 months Earth and Mars align in a straight line on either side of Sun, it is called Solar Conjunction. This will continue for two weeks, the communication with Mars missions in this time can be difficult as ionized gas from sun affects radio signals. Some of the signals sent during this time will be lost and can result in misinterpretation of data and corrupted commands. Even the current Mars orbiter missions are silent during these two weeks. This paper proposes a twin satellite mission to the L4 and L5 Lagrange region of Earth Sun system for improved communication with Mars mission. Lagrange regions are equilibrium regions created by gravitational and orbital forces of a two-body system and are naturally stable regions for spacecrafts. There are five Lagrange points L1, L2, L3, L4 and L5 for Earth Sun system. L4 and L5 are located close to Earth's orbit 60 degrees ahead and 60 degrees behind of earth. Mars is visible from L4 and L5 regions of Earth Sun System even at the time of conjunction. Two satellites will be placed at the L4 and L5 positions act as relay nodes for communication between Earth and Mars. It can reduce Free Space attenuation and creates an efficient network for communication. This paper also looks into the possibility of laser communication using the satellites instead of radio communication.