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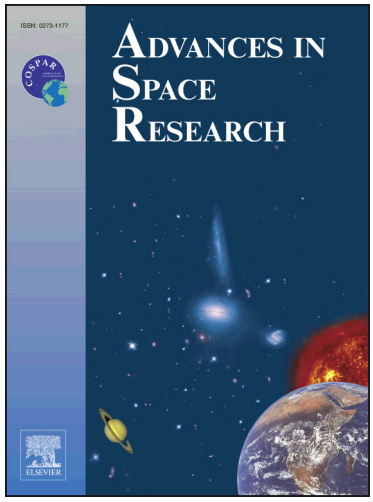

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Optimization design of inter-satellite link (ISL) assignment parameters in GNSS based on genetic algorithm

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Abstract

Global Navigation Satellite System (GNSS) inter-satellite links (ISLs) assignment parameters determine the topology of the satellite network, and directly affect the communication and measurement performance of the system. Key communication performance metric was developed based on the actual needs of the system. This paper studied the effect of time slice length and the number of slices in a polling cycle on the satellite network performance in GNSS. A double-loops algorithm is proposed to solve the optimization problem. Simulation results show that the average delay increases as the time slice length increases. Besides, a large value of the number of slices in a polling cycle is helpful to improve the orbit determination performance. Therefore, in order to improve the communication and measurement performance of the system, we can use both small time slice length and large number of slices in a polling cycle. The finding may give insight into the desige of ISL assignment parameters in GNSS.

Keywords: GNSS; inter-satellite link; satellite network

1 Introduction

Inter-satellite links (ISLs) play an important role in the new generation of Global Navigation Satellite System (GNSS). It is not only used to communicate and measure (D'Angelo et al. , 2012) for guarantee autonomous navigation, but also improves the accuracy of orbit determination for GNSS whose ground stations are limited in regions(Jin et al. , 2011, 2016). Research of ISL technology focuses on aspects of the ISL assignment, routing algorithm, orbit determination, time synchronization and link budget (Han et al. , 2014, Han et al. , 2013, Yi et al. , 2014). Since the ISL assignment decides the topology of satellite network, it directly determines the measurement and communication performance of GNSS.

Since the Block IIR satellite came into use, GPS has started using satellites with ISL function.

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