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EFFICIENT CHAOTIC BASED COMMUNICATION SYSTEM FOR A SATELLITE FORMATION FLYING CONFIGURATION

Abstract

Chaos-based communication systems have been considered as a very efficient communication approach to be used for interspace communication. The intrinsic complexity embedded on the chaotic dynamics with its hallmark property of sensitive dependence on initial conditions provides a masterful framework that can be exploited to develop remarkably fast, efficient and robust communication systems at low cost. The main idea is to embed the information signal in the chaotic signal which is transmitted over the communication channel. The remarkable properties of those systems have being extensively demonstrated in laboratory experiments. Very recently, a field experiment using commercial optical network was undertaken in which messages encoded in a chaotic waveform were successfully transmitted at gigabit per second range over 120 km of optical fiber in the metropolitan area network of Athens, Greece. This approach can also be used to support intensive distributed communication process over a network. This is also the scenario that may exist when the concept of satellite formation flying is used. A satellite in a formation flying is a group of satellites that fly within close range of each other. The formation operates as a "virtual" satellite with a very large capability that would require a huge, complex and expensive monolithic satellite. However, being synchronization is a prior requisite for coherent chaos communication. In the environment of a formation flight in space, because of the distance among the spacecraft, delays due to propagation time must be taken in account. In this work, we propose a new strategy that allow isochronous synchronization among chaotic signals in a network system and using this strategy, we present a system that allows distributed chaos-based communication among the satellites in the formation flight.