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RESEARCH ON HIGH-SPEED DETECTION TECHNOLOGY OF LASER SPOT IN
INTER-SATELLITE OPTICAL COMMUNICATION

Abstract

Space optical communication is an important and effective means to establish high-speed communication links between satellites and between satellites and ground. Compared with micro-wave communication, optical communication has many advantages such as large communication capacity, high transmission speed, good confidentiality and low power consumption. In order to establish a laser communication link between two satellites, the requirements for communication terminals are very strict, and it is required that the photo detector of one of them must accurately receive the beacon light signal of the other communication terminal and track it with high precision. However, the communication performance of space laser communication is affected by various unfavorable factors, such as absorption, scattering and turbulence, so it is very important to capture and track the communication beam quickly in the process of establishing and maintaining a stable communication link.

Aiming at the above problems, this paper adopts the hardware architecture of CameraLink + FPGA + PCIe on the development of image acquisition card, and designs and implements a set of high-speed spot image analysis system based on FPGA and PCIe card. Firstly, this paper describes the overall design scheme of the system; Filtering de-noising and adaptive binaryzation threshold processing are added before calculating the spot center, which can effectively improve the anti-interference performance of the system. The speed and accuracy of spot center detection are improved by coarse identification of spot center and gravity center calculation. The ground simulation system verifies the feasibility of the hardware architecture proposed in this paper, and the improved spot tracking algorithm has short detection time and stronger anti-interference ability.