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Guidance and implementation of photoelectric theodolite in shipborne environment

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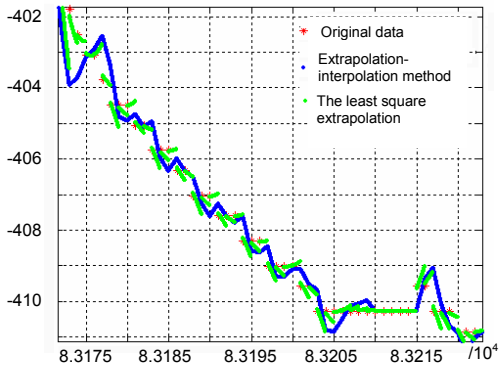

Extrapolation-interpolation method and the least square extrapolation.

Abstract: In order to accurately measure the trajectory and characteristic points of the carrier borne aircraft during the flight test, the shipborne photoelectric theodolite is adopted. According to the target position information and the video image information measured by the observation system, the solution is obtained in the deck coordinate system for the accurate trajectory of the target. However, due to the influence of the weather, the distance is short and the field of view is small. When the aircraft enters its working area, it is often too late to be tracked. Related research report is relatively small. In order to solve this problem, according to the ship and aircraft equipped with infrared guide, mutual guide and guide work, when a target signal appears, primary mirror of theodolite is guided to aim target direction. Once the target runs into the test area, it will be timely captured. The warship is generally equipped with photoelectric theodolite in shipboard plane flying test. Flight test equipment configuration of the aircraft is equipped with a real-time GPS system, and the ship is equipped with telemetry system, and therefore the project uses an external guide work.

According to the environment caused by theodolite data source interference and low data sending rate, the guidance algorithm of moving optoelectronic target under complex environment is proposed to solve the problem of photoelectric theodolite stability guidance. The GPS with three organic loading error cutoff methods is adjusted by extrapolation prediction data interpolation method, incremental tracking algorithm source guide smooth switching and coordinate transformation algorithm. Several algorithms are successfully applied to the project, and achieve good results.

In flight test, there are two sources of guidance: airborne GPS data and telemetry data sent by the network. Airborne GPS positioning system through the wireless data chain under the plane cause the ship affected by the electromagnetic environment and the plane distance. Pose variation and occlusion of wireless data link bandwidth and limited data issued by the noise pollution and low frequency eliminate the coordinate transmission conversion error after using three points method of gross error on the received data of coordinate conversion for the first time. The remote sensing system sends the guide data. The frequency is high, and the data is stable. The threshold method is used to remove the outliers and then participates in the guidance calculation. Aiming at the problem of guidance source signal low frequency and interference, thesis puts forward an extrapolation-interpolation method and a three points cut-off method, respectively. Thesis also puts forward gradually tracking algorithm for the smooth transition of guidance sources. The methods all above resolve effectively data filter, interpolation and multi-source problem which are encountered in the guiding photoelectric theodolite on the shipboard. The last moving base photoelectric equipment guidance formulae are educed based on GPS/INS integrated navigation information.

Keywords: flight test; photoelectric theodolite; moving base; outlier; guidance algorithm

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