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船载经纬仪测量数据的回归及补偿

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Regression and compensation of measuring data for shipboard theodolite

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摘要

基于舰载经纬仪的使用条件，分析了各测量范围内船姿变量和测角量之间的关系，提出了分段回归模型，并给出了舰载光测设备的回归测量方案及补偿方法。首先，基于船姿测角误差模型，结合多次不同测角范围内的实测数据残差，分析各测量变量间的相关性；通过摇摆台实验，结合双GPS定位数据，对测量数据进行分段双回归，建立了回归数据库。然后，提出了在执行任务前为事后回归处理进行附加观测的方案。最后，基于附加测量残差和回归数据库，提出以测量条件相似度为依据对任务数据进行补偿的方法。实验结果表明，船姿误差最大（航向72"，纵倾24"，横倾24"）时，补偿后光测设备的方位测角均方差由小于等于57"变为小于等于21"，俯仰测角均方差则由小于等于34"变为小于等于17"，基本满足了舰载光测设备对数据处理精度及稳定性的要求。

关键词 ： 舰载经纬仪, 船姿, 角度测量, 分段回归, 残差

Abstract :

On the basis of service conditions of a shipboard theodolite, the relationship between ship-attitudes in different scopes and measuring angles was analyzed, a segmented regression model was put forward, and a scheme of regression and compensation for the shipboard optical measurement equipment was given. Firstly, based on the ship-attitude error model and several different residual errors of experimental data, the correlation between the measured variables was analyzed. According to the characteristics of shipboard equipment, a segmented dual-regression model was given, and a regression database was established. Then, an additional observation scheme before mission was proposed for afterward regressing. Finally based on the additional measurement residual errors and the regression database, the compensating method was explained based on measuring condition similarity. The experimental results after compensation by proposed method show that the angle measuring errors(RMS) of the equipment change from less than or equal to 57" into 21" for the azimuth, and from 34" into 17" for the pitch respectively, when the maximum ship-attitude errors are at the head of 72", pitch of 24" and the roll of 24". The scheme basically meets the precision and stability requirements of the data processing for shipboard optical measurement equipment.

Key words : shipboard theodolite ship-attitude angle measurement segmented regression residual error

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