信息科学

基于信息融合实现的激光陀螺调腔检测

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摘要: 考虑激光陀螺调腔人工检测耗时较长、易受干扰,本文建立了激光陀螺自动调腔系统。在分析激光陀螺调腔工艺的基础上,构建了一种由CCD相机和光电倍增管组成的多传感器信息融合体系结构,提出了基于D-S证据理论的激光陀螺调腔检测方法。通过分析计算CCD相机和光电倍增管检测到的信号得出光斑、光阑中心点坐标差值及陀螺损耗值,并由这些信息获得调腔质量的评价函数。然后,根据D-S证据理论对评价函数进行融合处理,分别获得陀螺调腔质量合格与不合格的信度函数,应用最大支持度规则对调腔质量进行综合判断。实验结果显示,基于D-S证据理论的激光陀螺调腔方法检测准确率为91.14%,有效提高了调腔质量,验证了该方法的可行性。

关键词: 激光陀螺 调腔 检测 D-S证据理论 信息融合

Detection of laser gyro cavity adjustment using information fusion

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Abstract: An automatic cavity adjustment system was established to improve the quality of laser gyro cavity adjustment and to overcome the drawbacks of manual detection such as low efficiency and low anti-interference capacity. According to the process of the cavity adjustment, a multi-sensor information fusion architecture was established by a CCD camera and a photomultiplier. A detection method of laser gyro cavity adjustment was proposed based on the D-S evidence theory. By analysis and calculation of the signals detected by the CCD camera and the photomultiplier, the center coordinate difference between facula and diaphragm and the loss value of the laser gyro were obtained and the evaluation function for each cavity adjustment result was deduced by these data. Furthermore, the qualified and unqualified belief functions of the cavity adjustment were obtained, respectively, and the quality of the cavity adjustment was verified based on the maximum support rule. The experimental result indicates that the accuracy of the detection method based on D-S evidence theory is 91.14%, which improves the quality of cavity adjustment effectively and validates the feasibility of the proposed method.

Keywords: laser gyro cavity adjustment detection D-S evidence theory information fusion

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