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信息科学

灰色关联分析方法在双目视觉测量系统误差分析中的应用

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摘要： 针对双目视觉测量系统存在误差因素繁多、分析困难等问题，提出了一种基于灰色关联技术的误差分析方法。考虑视觉系统的灰色属性，将灰色系统理论及其相关技术运用于视觉测量系统的误差分析。以镜头畸变、质心定位误差及双目视觉系统内、外参数等9项因素或参数为自变量，通过基于单项因素变化的实验，获取了误差分析的数据样本；采用灰色数据处理方法及灰色关联分析技术，从无明显规律的数据样本中明确了视觉系统各项误差因素对最终测量精度的影响。分析结果证明了灰色理论用于定量分析视觉系统误差的正确性和有效性；在灰色理论意义下，镜头径向畸变、切向畸变、摄像机夹角及特征点质心定位误差4项因素对测量精度的关联度均大于等于0.859，高于其余误差因素。

关键词： 视觉测量 误差分析 灰色系统理论 灰色属性 灰色关联分析

Grey incidence analytic method to error analysis of binocular vision measurement system

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Abstract: According to the excessive error factors and difficult analysis of the binocular vision measurement systems, an error analysis method based on grey incidence technology was proposed. The grey attributes of the vision system were analyzed,and grey system theory and its correlation technologies were introduced into the error analysis of the vision measurement system. 9 factors or parameters such as lens distortion, centroid positional error, internal and external parameters in binocular vision system were all selected as independent variables, then sampled data were obtained for error analysis through experiments based on single factor variation. According to grey data processing method and grey incidence analysis technology, the influences of all error factors on final measurement accuracy were definited by irregular samples. Experimental results demonstrate the exactitude and validity that the grey theory is used for quantitatively analysis of errors for the vision system. Under grey theory significance, the incidence degrees of measurement errors with four kinds of factors,the radial distortion and tangential distortion of a lens, the included angle between two cameras and centroid positional error in feature points are larger than 0.859, which is higher than those of other factors.

Keywords: vision measurement error analysis grey system theory grey attributes grey incidence analysis

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