光学计量与测试

基于立体视觉的风洞模型姿态测量方法

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摘要：

探讨一种基于立体视觉的风洞模型姿态测量新方法。在模型壳体上安装一个可生成2根双向准直激光束的合作目标，然后将模型安放在两个幕墙之间。投射在幕墙表面的激光束生成4个指示光斑，借助于立体视觉技术测量出每个指示光斑在世界坐标系内的3D坐标，然后根据向量的坐标变换原理确定风洞模型的姿态。给出了确定模型姿态的解析表达式，此外在实验室环境下对该方法作了验证，初步的实验结果表明：当幕墙间距约为6m时，姿态角的最大测量误差不超过0.05°。

关键词：　立体视觉　风洞模型　姿态测量

Stereo vision based attitude measurement of aircraft model in wind tunnel

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Abstract:

This paper investigates a stereo vision based method for model attitude measurement in wind tunnel test. A cooperative object, which can generate two bidirectional collimated laser beams, is firstly mounted on the shell of an aircraft model, and then the aircraft model is placed between two screens. The laser beams, which are projected onto the screen surfaces, generate four laser spots. Once the 3D coordinates of the laser spots are measured accurately by means of stereo vision technique, the attitude of the aircraft model can be determined by the principle of coordinate transformation. The analytical expressions for determining the attitude of an aircraft model in wind tunnel are presented in the paper. In addition, the proposed method was validated in a controlled laboratory condition. The preliminary experimental results show that the maximal error of attitude measurement is less than 0.05° on condition that the distance between two screens is about 6m.

Keywords: stereo vision　aircraft model　attitude measurement

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