

## 基于视觉的电子激光经纬仪空间点自动瞄准方法

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基金项目：恶劣现场条件下超大空间坐标精密测量原理与方法研究

摘要：

为提高电子经纬仪系统的工作效率，将图像处理技术与传统测量方法相结合，提出了基于插值算法的自动电子激光经纬仪空间点坐标测量方法。首先介绍了系统结构，接着说明了外置摄像系统在近距离长焦模式下实现光学放大，利用质心算法得到亚像素级别的目标定位精度的方法；然后利用电子激光经纬仪扫描线模型，通过离散点插值方法得到概率瞄准状态下经纬仪对准目标质心时的精确角度值，最后通过前方交会法计算空间点三维坐标。实验数据表明，该方法可以有效提高测量效率，在 $20\text{m} \times 20\text{m}$ 空间范围内获得不低于 $\pm 0.02\text{mm/m}$ 的测量精度。

关键词：大尺寸测量；电子经纬仪；视觉测量；扫描线模型

## The Vision-based Automatic Collimation Methodology of Electronic Laser Theodolites for Spatial Coordinate

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**Abstract:**

In order to improve the efficiency of electronic theodolite systems, combining image processing technology with the traditional measuring principle, an automatic spatial coordinate method for electronic-laser theodolites based on image interpolation was represented. First, the system structure was represented, then the process to locate the center of the target by centroid algorithm with sub-pixel position accuracy was introduced after optical magnification as outer CCD camera worked in tele-focus mode with short distance, the scan line model was used to calculate the very horizontal and vertical angles of the theodolites on non-exact collimation conditions by discrete points interpolation method subsequently, the spatial coordinates were attained by forward intersection method at last. The experimental result showed that the methodology was feasible and efficient with the accuracy of  $\pm 0.02\text{mm/m}$ .

**Keywords:** large scale measurement; electronic theodolite; vision measurement; scanning line model

投稿时间：2011-03-17

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