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基于激光三角法的地表粗糙度测试仪的研制

Development of surface roughness tester based on laser triangulation method

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中文摘要:

针对接触法测试地表粗糙度需要人工参与、测试时间长等问题,该文提供了一种快速的地表粗糙度测试的仪器及测试方法。基于激光三角原理,将激光投影到待测目标上,摄像机接收反射光的图像,通过图像处理算法及坐标转换得到被测区域的三维坐标,再根据粗糙度计算公式得到地表粗糙度参数的结果。将该仪器分别进行了精度及野外测试试验,精度试验测量结果的平均相对误差最大值为2.93%,仪器典型分辨率在垂直仪器扫描方向为0.78?mm,仪器扫描方向为1?mm,垂直大地方向为0.83?mm。试验结果表明,农田表面空间自相关系数的测量结果反映出了农田的垄结构特征,验证了该文仪器及方法的可行性及有效性。

英文摘要:

In order to solve the problems of manual intervention and long testing time existed in using contact method to test surface roughness, a fast testing method and an instrument for surface roughness were proposed. Base on laser triangle principle, laser was projected onto the testing object and the image of reflected light was received by camera, and the 3D coordinate of measurement area through the image processing algorithms and coordinate transformation was obtained, and then the parameter results of the earth's roughness were obtained on the basis of the roughness computing formula. Also, field experiments and precision experiment were conducted with this instrument. The maximum of average comparative error for measurement result was 2.93% through precision experiment. The instrument's typical resolution level was 0.78, 1 and 0.83 mm, in the scanning's vertical direction, in the scanning and in the earth's vertical direction, respectively. The experimental results showed that the spatial autocorrelation coefficient of soil surface can express row structural characteristic of furrowed soil, which verified the feasibility and availability of the instruments and methods proposed in this paper.

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