

Design and Development of Three-Dimensional laser Roughness Measurement Apparatus

M. Sharifzadeh and S. Siraei

ABSTRACT

Rock mass behavior is closely depends on rock joints characteristics, rock joint behavior is depends on its surfaces roughness. There are several methods to measure joint surfaces roughness by two or three dimensional. Three dimensional methods are expensive and advanced technology, thus to obtain high precision roughness of joint surfaces a new apparatus is designed and developed for first time in Iran. Using the designed apparatus the joint surfaces measurement with high precision is possible with low expenses. The apparatus is made up of two parts consisting hardware and software. Hardware consists of: laser head, cross table, and digital camera. The measured data is processed in software to obtain three dimensional surfaces roughness. As an advantageous of the developed apparatus it is possible to determine surface roughness using non-destructive method and same sample could be used for mechanical laboratory testing. To verify the apparatus performance a rock joint specimen roughness profiles is measured with 1mm intervals and the surface topography of joint surface is obtained with 1mm*1mm cell size. In this paper the apparatus assembly and its application along with the results are illustrated.

KEYWORDS

Joint, Roughness, Laser, Rough measurement, Image processing

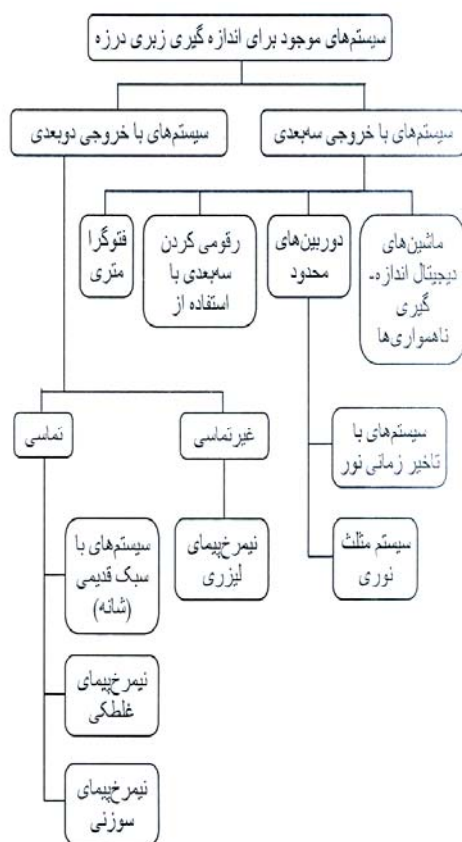
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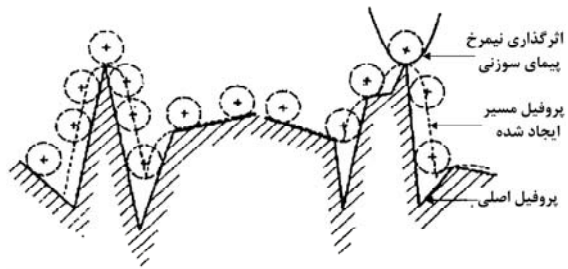


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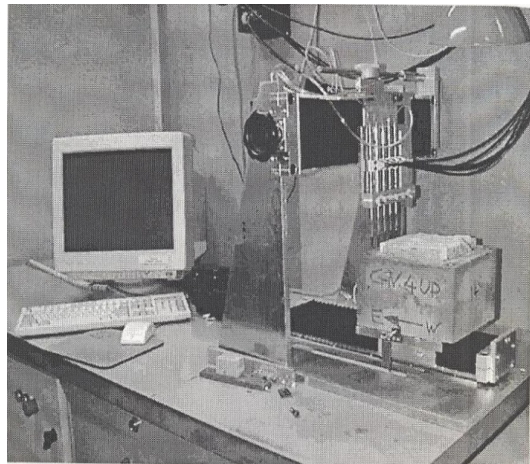


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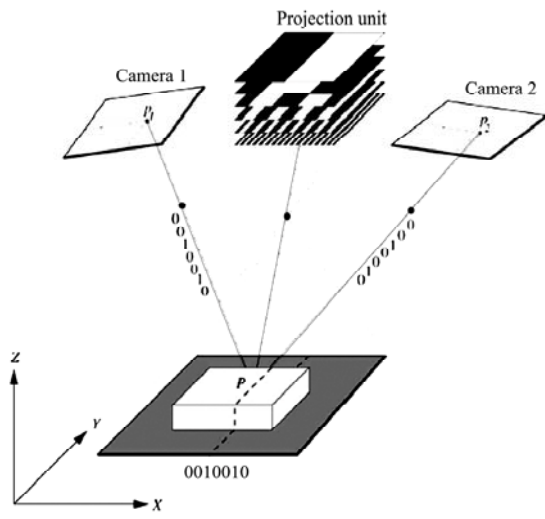


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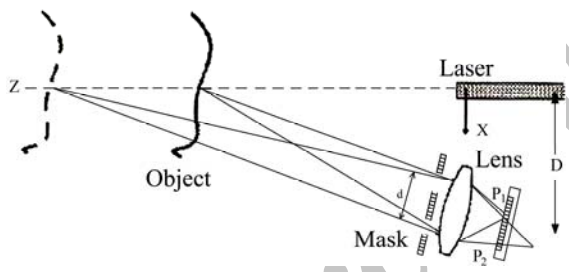
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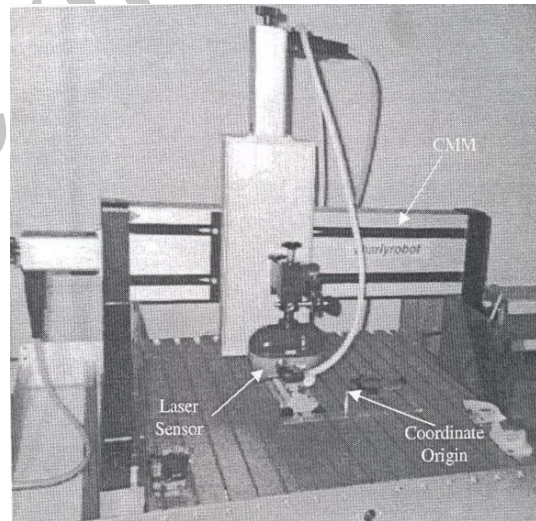
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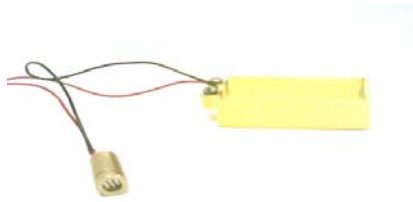
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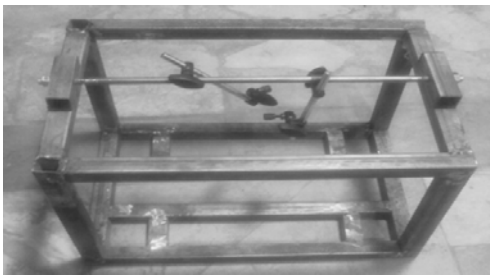




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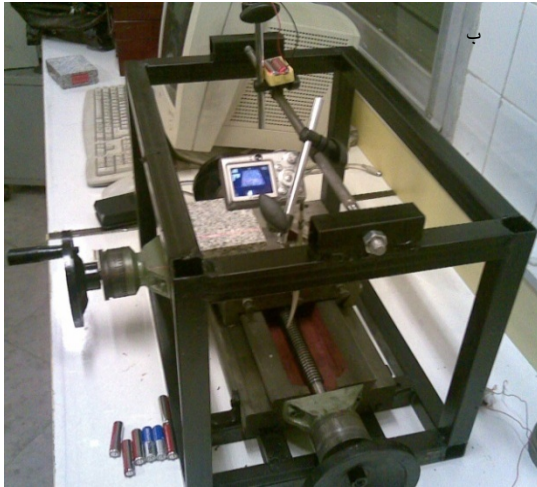
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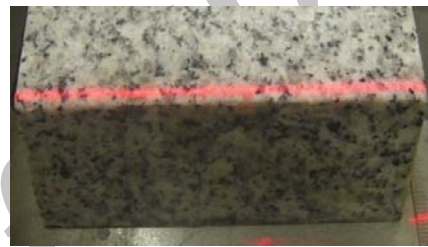
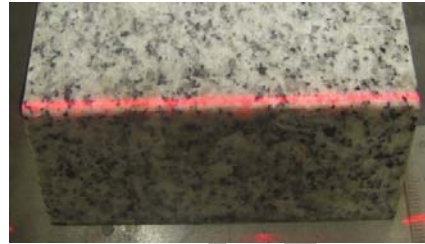
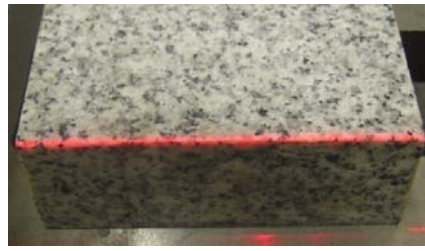
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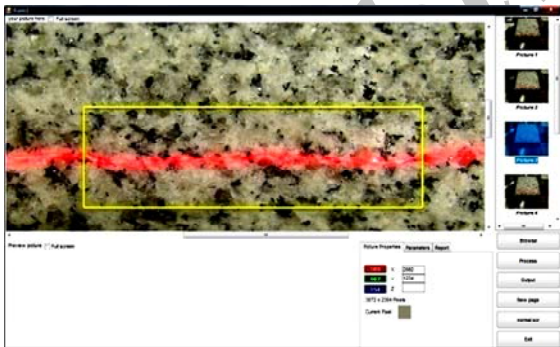
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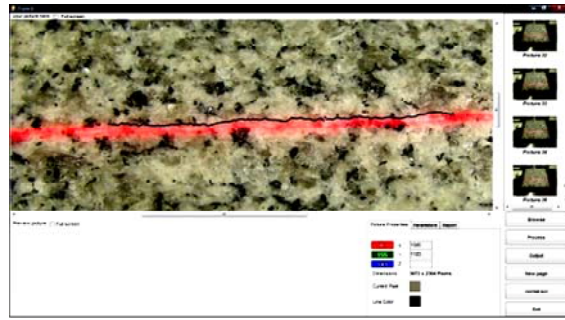
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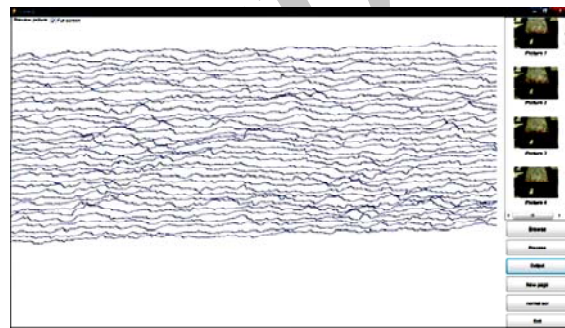
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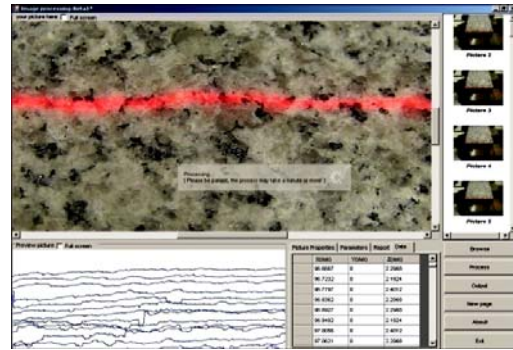


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¹Joint Roughness Coefficient

²Barton

³ Digital Coordinate Measuring Machine

⁴ Renishaw

⁵ Needle-tip Profilometer

⁶ Roller-tip Profilometer

⁷ Interferometer

⁸ Spot

⁹ Charge Coupled Device

¹⁰ Photogrametry

¹¹ Jesselle et al

¹² Range Cameras

¹³ Optical triangulation systems

¹⁴ Light time delay system

¹⁵ Assembling

¹⁶ Red-Green-Blue

¹⁷ Pixel

¹⁸ Bitmap

¹⁹ Raster