

THREE-DIMENSIONAL DISPLACEMENT MEASUREMENTS OF HEATING METALLIC DEFORMATION BY LASER ELECTRONIC SPECKLE PATTERN INTERFEROMETRY

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KEY WORDS: laser electronic speckle pattern; metallic deformation; three-dimensional displacement

Speckle interferometry has always been paid much attention because of its many advantages, such as non-contact, high-accuracy and full-area etc^[1]. Under the combination of speckle technology, laser interference technology and computer image processing techniques, laser electronic speckle pattern interferometry(LESPI) can work immediately by using high-accuracy image collection system and computer image processing system. In this paper an experimental platform was set up based on heating metallic deformation measurement technology. For measuring the three-dimensional deformation displacement of a heating aluminum block, an image processing program was designed based on VC++ software platform. The measured object is a metal aluminum piece whose length is 60 mm, width is 60 mm and height is 15 mm , Aluminum piece is heated to generate reshaping. Laser is the He-Ne laser of 632.8 nm with wavelength. The laser speckle that gathered is shown in Fig.1, Fig.2 shows the subtracted speckle images during fore and after of the distortion, Fig.3 is the result of Fig.2 being two-valued. The near smooth skeleton curve is got by extration location for dark stripe and fitting four times , as Fig.4. The result ,which is fitted to surface distortion of aluminum piece with the help of outcome in Fig.6, is shown in Fig.5. The variation of distortion is about four halves wavelength, that is to say round 1.3 μm .

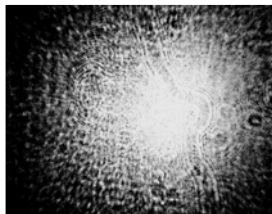


Fig.1 Electronic speckle pattern image



Fig. 2 Subtraction image



Fig. 3 Two-valued processing

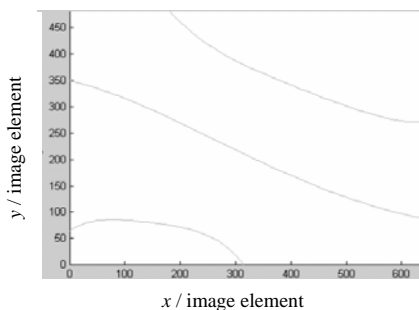


Fig.4 Skeleton curve after being fitted four times

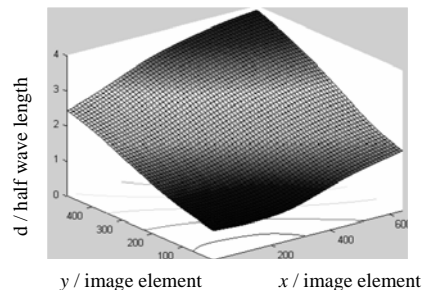


Fig. 5 Three-dimensional image of object's surface distortion of the heated Aluminum piece

REFERENCE

[1]SVANBRO A, HUNTLEY J M, DAVILA A, "Optimal rereferencing rating for in plane dynamic speckle interferometry,"*Appl Opt*, 42,251-258(2003).