Accuracy Improvement of Digital Image Correlation by a Simple Super Resolution Method

Pengxiang Bai*, Feipeng Zhu*, and Dong Lei

*Corresponding author’s email: baipengxiang@hhu.edu.cn

Researchers have been developing new methods to improve the accuracy of digital image correlation (DIC) for decades, and the proposed methods could be mainly divided into two classes, the software and the hardware methods. One embranchment technique among the hardware methods is increasing the spatial resolution of the imaging system, which means recording more details of target surface by increase the pixel resolution with the field of view fixed. Since more information of interested area adopted in the image correlation processing, higher displacement and strain measurement accuracy could be achieved. To increase spatial resolution of imaging system a simple super resolution methods is proposed, in which a telecentric lens and two pieces of sheet glass are employed as the imaging system. The optical field from the target surface propagates through the two glass sheets and into the telecentric lens. By tilting one glass sheet slightly the optical field would be translated by sub pixel, thus a translated image could be obtained. Assembling the translated images, a super resolution image with much higher spatial resolution could be formed. Applying the digital image correlation algorithm to the super resolution images, the improved displacement and strain accuracy could be achieved.