Abstract Submitted
for the SES13 Meeting of
The American Physical Society

Analysis of residual stress using ESPI SAUGAT GHIMIRE, SEAN CRAFT, SANICHIRO YOSHIDA, Southeastern Louisiana University — Residual stress exists within a material in the absence of external forces and arises from various manufacturing processes. The material under consideration is a welded metal sample consisting of two metals (stainless steel and carbon steel). The cause of residual stress in this case is the fact that the two metals, when cooled down after the welding process, contract at different rates due to the relative difference in their coefficient of linear expansion. We use dual beam Electronic Speckle-Pattern Interferometry (ESPI). It involves applying tensile forces on the welded sample, and subtracting the sample image taken before the application of the force from taken after; this forms the so-call fringe pattern that represents the deformation map of the entire sample. Our method of analysis is based on the following hypothesis: The stiffness of materials is known to depend on stress. If a static load is applied to a welded sample, applied force will be uniform for the entire specimen. Therefore, residually-stressed parts of the specimen should respond to the uniform force differently from non-residually stressed parts. This difference can be revealed as non-uniformity on the corresponding ESPI fringe pattern.

sanichiro yoshida
Southeastern Louisiana University

Date submitted: 20 Sep 2013 Electronic form version 1.4