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Dynamic deformation analysis by Electronic Speckle Pattern Interferometry SHUN TAKAHASHI, SANICHIRO YOSHIDA, Southeastern Louisiana University, TOMOHIRO SASAKI, Niigata University — The aim of this study is to develop a dynamic analysis method for in-plane displacement measurement with Electronic Speckle Pattern Interferometry (ESPI). ESPI is an optical method that uses the interference of speckle patterns formed on material surfaces by laser. Our ESPI technique forms speckle patterns (interferogram) with two lasers applied to the specimen surface at two different incident angles so that in-plane displacements of points on the surface cause relative phase change between the two optical paths. We keep taking interferograms at a constant time interval and subtract electronically the interferogram formed at a time step from another. So-called interference fringe patterns are formed from each pair of interferogram where dark fringes represent contours of displacement proportional to the laser's wavelength. For quantitative analysis we need to locate dark fringes on the fringe pattern, express them using the coordinates variables, and evaluate the relative phase change on all coordinate points. This task is complicated because the orientations and locations of dark fringes are random. In this study, we apply techniques widely used in neural network algorithms to locate dark fringes and evaluate relative phase changes automatically.

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