

Breast Surface Variation Phase Map Analysis with Digital Fringe Projection

Abstract

Breast carcinoma has become one of the most frequently diagnosed life threatening cancer among women. Early detection of breast cancer is highly essential with the aid of non-contact imaging modalities. Recently, non-contact breast imaging methods based on fringe projection has been developed for breast surface change inspection. In this work, a non-contact digital fringe projection imaging modality that utilizes phase shifting fringe patterns for identifying surface changes has been developed for investigating breast surface changes caused by the presence of tumors. A medical grade prosthetic breast was used as the experimental subject and subjugated to breast changes through the enlargement of a round shaped silicon catheter as a tumor. The fringes were projected onto the breast surface based on the three steps phase shift fringe projection. The fringe patterns consisted of a large fringe width to enable the breast image to be confined in fewer fringe patterns. A resulting phase map was obtained where pixel coordinate marking was conducted on the phase map breast image. Each of the pixel's coordinate was compared to identify the location of the surface changes. A range of 2-9 pixel coordinate shifts from the 0.5 – 2 cm tumor growth were obtained from the results which demonstrated the capability of using phase map analysis from digital fringe projection in identifying surface changes of the women's breast.

Keywords: Breast tumor, Digital fringe projection, Phase shift profilometry, Breast imaging modality