

# **An image based inspection method for detecting fiber orientation of carbon fiber reinforced plastic parts using X-ray Talbot-Lau interferometer system**

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An image based inspection method is proposed for detecting fiber orientation of CFRTP (Carbon Fiber Reinforced Thermo Plastics) parts. Their radiographic images are taken by using an X-ray Talbot-Lau interferometer imaging system because the carbon fibers cannot be imaged in the absorption images due to the similar absorption property of resin and the carbon fibers. We use small angle scattering images obtained by the X-ray Talbot-Lau interferometer imaging system. In these images, the fibers extending in the grid direction of the interferometer are well captured so that the fiber orientation can be obtained by analyzing the images taken at different directions. We propose a method to detect fiber orientation with a single radiographic image. Problem is that fibers not orienting along the grid direction are rather dark to estimate their orientation. We solve this problem by computing ‘certainty’ values of the fiber orientation which reflect the consistency of the orientation around a position on a fiber. Thus the intensity of the fiber image are not so much involved in their computation so that the orientation can be computed even in the dark region of fibers. This idea of the certainty values was proposed as a method to estimate orientation of human hair for computer animation. We extended it to be adaptable to the case of a small angle scattering images of CFRTP parts. In the paper, we will show the details of our method with experimental results.