Future directions in hot metrology and non destructive testing for additive manufacturing

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A number of measurement challenges exist within the realms of dimensional metrology and Non Destructive Testing (NDT). In particular, metallic Additive Manufacturing (AM) is a rapidly growing field, which offers the potential to become a massively disruptive technology within high value manufacturing. Despite the rapid growth in research and industrial interest, the ability to identify non-conformances in high value parts is holding back large scale uptake of the technologies in industry. Still in its infancy, non-destructive inspection of AM parts has mainly been carried out using by X-ray Computed Tomography (XCT). However, this method is prohibitively expensive and often far exceeds requirements. Offering high resolution imaging and the ability to compensate for complex surfaces, ultrasonic synthetic aperture imaging could provide an alternative with comparable capabilities, but at a significantly lower cost. While research into solutions such as this are required for new technologies like AM, mature techniques are also in need of novel measurement applications. Specifically, while highly accurate methods of dimensional measurement are available for forged parts, there is no commercial measurement equipment which allows for dimensional measurement of parts during the forging process. Due to the heat applied to parts, contact and even optical techniques can be contraindicated. In order to provide dimensional information on hot parts during forging, new techniques need to be created and existing methods must be adapted. Therefore, this work presents early stage investigations into both dimensional measurement of hot parts using optical reconstruction methods and non-destructive investigation of additively manufactured parts using full matrix capture and ultrasonic synthetic aperture image reconstruction.

Keywords: non destructive testing, additive manufacturing, hot parts

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