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3D Surface Inspection and Printing

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Abstract

3D metrology with a market in 2022 in the order of 11 billion USD is becoming more and more important for 3D printing. On the other hand, 3D printing can give an invaluable contribution to 3D metrology and the evaluation and interpretation of the results of 3D inspection. Non-destructive dimensional inspection of surfaces is an issue of utmost importance in a large number of situations in R&D and at the industrial world. An increasing number of surfaces and surface types must be 3D characterized in a non-destructive non-invasive way. Statistical parameters, both 2D and 3D, are fundamental to a useful quantitative characterization of the surface' relief. However, the two and tridimensional magnified representation of the microtopographic structure of the surface, allowing a comfortable and detailed visualization of the relief structure, gives very meaningful insights and is more and more requested. Increasing computer processing power and speed and new software allows our days a very efficient visual inspection of the results of the microtopographic inspection of surfaces and parts. Recently the resolution accuracy and reliability of 3D printers is achieving rather interesting figures. It is now possible not only to visualize, in a high-resolution screen, the amplified 3D relief structured of the surface but also it is possible to 3D print it. The "tactile" visualization of the 3D printed physical model of the inspected surface is an interesting experience that may lead to a fast meaningful assessment of the relief of the inspected surface. Optical triangulation in different approaches allow the establishment of metrological systems that by its inherent relative simplicity versatility robustness and reliability can cope with most modern requirements of the non-invasive inspection of objects and surfaces both smooth or rough. In this communication we will present a brief review of the work done at the Microtopography Laboratory of the Physics Department of the University of Minho, Portugal, on the optical triangulation based microtopographic inspection of surfaces.

Keywords
3D metrology; microtopography; 3D modelling; surface inspection

Biography

Manuel F. M. Costa hold a PhD degree in Science (Physics) from the University of Minho (Portugal) where he works since 1985 at its Physics Department teaching and performing applied research in optical metrology, image processing, thin films nanostructures and applications, instrumentation, and, science education and literacy. President of the Ibero-American Optics Network, RIAO, for the term 2019-2022. President of the Hands-on Science Network, HSCI. Deputy Chair of the Scientific Advisory Board of the European Optical Society. Executive Committee member and Europe Regional Representative of the International Council of Associations for Science Education, ICASE. President of the Portuguese Society for Optics and Photonics, SPOF. Fellow of European Optical Society.