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## Abstracts


Euroscicon Conference on

# 3D PRINTING

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# A HIGH-SPEED ADDITIVE MANUFACTURING APPROACH TOWARDS DIRECT DIGITAL MANUFACTURING

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Direct Digital Manufacturing (DDM) of customized end-use product on demand is the key concern of forth industrial revolution. In order to implement DDM to future manufacturing industry, it must have the potential of mass production, high accuracy with functional material property. Though the unique capabilities of AM make it suitable for DDM, there are numerous limitations in existing AM technologies that restricted its inclusive penetration in the manufacturing industry. The key challenges of AM include low speed of production, less accuracy and repeatability, and a limited selection of materials with the most suitable material property for a particular application. However, hybrid additive manufacturing, which is an integration of AM with subtractive technologies, may fix the aforementioned challenges; it may restrict the utilization of AM capabilities up to a certain limit. Therefore, a high speed AM system is required that is capable of achieving three key criteria i.e. the high speed of production, high accuracy and surface finish, and functional material property, without integration with subtractive technologies. In this paper, a High-Speed Additive Manufacturing (HSAM) approach is presented. For better understanding, the author describes those AM technologies that are capable of mass production of highly accurate parts with functional material property. The samples of various dimensions were 3D printed by using same material (PA12) on a Selective Laser Sintering (SLS) and a High Speed Jet Fusion 3D printer. The results were compared in the context of printing speed and surface roughness. Results revealed that Jet fusion process is extremely faster than its counterpart while sacrificing surface roughness (Ra) to some extent. The samples printed by the SLS process had 15% lower value of Ra compared with High-speed jet fusion process. The results also revealed that the jet fusion process may be able to print composite/multi-materials; however, more research needs to be done.

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# A CELLULAR POROUS STRUCTURE MODELLING AND ITS UNIAXIAL TENSILE TESTING

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**Modern technologies enable us to produce much more sophisticated components of industrial applications. It requires the designers to change their thinking at product design. Recent advances in additive technologies brought also the possibilities to make the lightened parts, thanks to so-called cellular structure in their core. When the structure is regular, the mechanical properties of the part can be controlled and the specific type of the cellular structure can be used in a specific product when the mechanical properties and behaviour of this cellular structure in real conditions are known. The article deals with the triply periodic helical structure of minimal surfaces produced by the additive approach and its mechanical properties. One of the complex porous structures created based on the minimal surfaces along with the approaches that can be used for the structure modelling is described in the paper. In the last part of the article, the experimental study of this structure and the achieved results are described. Maraging steel MS1 was selected as the material for structures production using Direct Metal Laser Sintering (DMLS) technology. The results have shown that the unit of a triply periodic helical structure with a lower volume ratio is able to carry a greater relative load to failure then the unit of the structure with higher volume ratio.**

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# TACTILE GRAPHICS FOR VISUALLY IMPAIRED PERSONS: EFFICIENT SOLUTIONS WITH 3D PRINTING TECHNOLOGY

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In the past, the production of tactile graphics (tactile maps, tactile images and diagrams) for the visually impaired presented a great challenge. Today, the technology of 3D printing makes the translation of visual information into tactile information fast and simple. The process calls for a thorough understanding of the tactile and haptic perception of visually impaired persons. Tactile maps serve two main functions: teaching geography and ensuring effective orientation and mobility of visually impaired persons. A new tactile map production process supports indoor and outdoor navigation of visually impaired persons, while tactile images and diagrams enable learning and provide them with an understanding of a variety of subjects and spatial relations. The Geodetic Institute of Slovenia has conducted a series of tests and developed an automated procedure for the production of tactile graphics with the latest 3D printing technology for the visually impaired. The article focuses on the accumulation and analysis of data, the translation of visual information into tactile graphics, and the 3D printing process. Several production cases from Slovenia will be presented: the tactile map for orientation and mobility of the capital of Slovenia–Ljubljana, the tactile model of the Ormož Basins Nature Reserve, the tactile map of the Centre for Urban Culture Ljubljana, the tactile map of the Slovene Ethnographic Museum, the tactile model of the Sečovlje Salina Nature Park (the traditional production of salt), the tactile plate of the famous Schutze ceramic plate from 1886, the tactile map of the Union of the Blind and Partially Sighted of Slovenia Library, and the tactile map of the Northern Sky.

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