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3D Printing in Construction Industry: Construction of the Future Sustainable Houses

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Abstract

3D printing (3DP) has long been used in the manufacturing sector as a way to automate, accelerate production and reduce waste materials. It is able to build a wide variety of objects if the necessary specifications are provided to the printer and no problems are presented by the limited range of materials available. With 3DP becoming cheaper, more reliable and, as a result, more prevalent in the world at large, it may soon make inroads into the construction industry. Little is known however, of 3DP in current use the construction industry and its potential for the future and this paper seeks to rectify this situation by providing a review of the relevant literature. In doing this, the three main 3DP methods of contour crafting, concrete printing and D-shape 3DP are described which, as opposed to the traditional construction method of cutting materials down to size, deliver only what is needed for completion, vastly reducing waste. However, current 3DP processes are known to be costly, unsuited to large-scale products and conventional design approaches, and have a very limited range of materials that can be used..

Key words: 3D printing, Contour crafting; Concrete printing, D-shape.

1. Introduction

The construction industry has traditionally relied on specifications and 2D drawings to convey material properties, performance details and locational information – using small-scale models, typically constructed on wood, to create the object for evaluation as part of the design process. Increasingly, these are being replaced by 3D modelling in the virtual environment of Building Information Modelling (BIM). An alternative is the use of advanced 3D solid modelling techniques in combination with digital fabrication methods [1]. This form of modeling is known as rapid prototyping, saving time by the negation of the human modeler, or toolmaker [2]. Rapid prototyping is an automated