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# Printing Direction Optimization Through Slice Number and Support Minimization

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**ABSTRACT** One major drawback of 3D printing technologies is the low printing efficiency. I it takes 8-12 hours to print a normal 3D model. 3D printing technologies manufacture objects lay where each layer is composed of one or more closed 2D polygons (named as slices in this w result, the number of slices will directly affects the printing time. In addition, most 3D printing tec need extra supporting structures to support overhang regions during printing, such as Fused I Modeling (FDM), which will largely increase manufacturing time. We observe that both the slici and the amount of supporting structures are affected by printing direction. In this work, a nov direction optimization algorithm is proposed based on the amount of slices and overhang are proposed method, Genetic Algorithm is used to obtain optimal printing direction where the fitnes is designed as the weighted slice number and overhang areas. Experimental results show that the algorithm is able to obtain an optimal printing direction to reduce the number of slices and overh

**INDEX TERMS** 3D printing, slicing optimization, printing efficiency, genetic algorithm, s structure.

## I. INTRODUCTION

3D printing (also named as additive manufacturing) is now widely used in small-scale prototype design and innovation projects due to its flexibility and low-cost. This new manufacturing technology largely changes the traditional subtractive manufacturing, and brings the change of manufacturing processes and production models. There are several 3D printing and chemical properties of the ob printing technologies cannot me requirements. Thirdly, 3D printin a long time to produce even a s affects their application fields. F of 3D printing technologies, res lot of explorations. Among these