Abstract

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Modelling Stereolithography Process Parameters Using System Dynamics

Stereolithograph is one of the most popular processes in additive manufacturing. Inefficiencies in the stereolithography process, which lead to unsatisfactory levels of quality in parts produced, are reported in literature with focus on finding the correct setting of different parameters that affect the process. Although these works studied the effect of different building strategies on part characteristics yet, these only reported the effect of the parameters without taking into consideration the interrelationships of these parameters that is conflicting in nature. Hence, a systems approach is needed that can identify these interrelationships and enhance learning and understanding of this system of interacting parameters. System dynamics is a method to describe, model, analyze and simulate dynamically complex systems where, in this paper, two of the system dynamics diagramming tools, the causal loop diagram and stock and flow are used. Causal loop diagram is used to capture the interactions between the Stereolithography process parameters. The causes and effects of the most significant parameters are described. Stock and flow is used to visually show how variables change with time. Stock and flow, along with simple mathematical equations has enabled to simulate the behavior of the system over time. The model developed has shown to be very useful in understanding the interactions between these building parameters and how they affect the part building time efficiency