

Research Summary

Feasibility of 3D Printing Applications for Highway Infrastructure Construction and Maintenance

Research Need

In recent years there has been a significant increase in interest in additive manufacturing, yet AM is largely unexplored within infrastructure projects, although it can provide unprecedented new design capabilities.

Goals/Objectives

The main goals of this project were to explore the feasibility of 3D printing application for the construction and maintenance in the framework of MassDOT. AM technologies have been progressing immensely in the last decades, but this progress has not really been reflected in processes regarding infrastructure and the transportation sector.

Within this research goals, we achieved to first connect the MassDOT community with AM in terms of the technology. This project demonstrated the new opportunities which have opened up for the usage of AM in the transportation and infrastructure sector in general. Although the path for successful application of AM is not linear, all participants in the project have concluded that there is a future where AM can play a significant role in improving the construction and maintenance of our transportation infrastructure. One of the immediate next steps in this research effort will focus on additive repair of deteriorated steel bridges.



Methodology

During the project we held several discussions with MassDOT personnel in addition to the 2-day workshop which brought together the MassDOT engineers with the researchers and industrial 3D printing companies.

In addition, high-level assessment of manufacturability were presented and followed for proposed objects such as the bearing of bridges. Cost estimates about materials, machine usage and build consumables were also accounted for in the decision making process for manufacturability establishing a roadmap for potential studies of other candidate objects for printing.

Key Findings

This project demonstrated the new opportunities which have opened up for the usage of AM in the transportation and infrastructure sector in general. Although the path for successful application of AM is not linear, all participants in the project have concluded that there is a future where AM can play a significant role in improving the construction and maintenance of our transportation infrastructure.

Use of Findings

One of the immediate next steps in this research effort will focus on additive repair of deteriorated steel bridges.

Also an initial framework of standard operating procedures for AM within MassDOT was presented which could be implemented. Where possible, leverage existing standards for evaluating component performance. The material, process, and post-processing standards described at the beginning of this section of the report are used to qualify a printing process to reliably produce the same quality of parts during each successive print. These standards are therefore not necessary where the MassDOT is only concerned with finished part performance. As long as printed parts are demonstrated to conform to required levels, there is no need for MassDOT to invest time in evaluating the standardization of the production process through which the parts are fabricated. In general, MassDOT would benefit from participation in standardization bodies and professional associations focused on standardization in AM.

Project Information

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