H7.02-1343 - In Situ Monitoring of In-Space Manufacturing by Multi-Parameter Imaging

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NON-PROPRIETARY DATA

IDENTIFICATION AND SIGNIFICANCE OF INNOVATION

Ensuring production quality is crucial for in-space manufacturing (ISM). The proposed small business innovative research is a feasibility study of an in-situ inspection unit that can be added to an existing additive manufacturing (AM) tool, providing real-time information about the part quality, and detecting flaws as they occur. The information is used to a) qualify the part, b) to providing feedback for correction, or to stop the process if the part will not meet the quality, thus saving time, energy and reduce material loss. The approach is based on multi-parameter imaging technique that can detect flaws in real-time for each AM print layer, such as dimensional deviation, micro-structured defects, wide gap between print lines, and determine surface finish. The significance of this innovation is the ability to accurately predict flaws by using multi-parameter imaging approach. Observed defect parameters will be correlated to known values, thus enabling prediction of part performance/material outcomes, and the approach will be demonstrated into a ground based AM systems.

TECHNICAL OBJECTIVES AND WORK PLAN

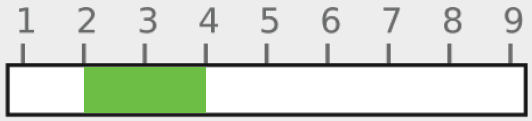
The main objectives are: 1) Design and fabricate samples using FDM (fused deposition modeling) to be used for testing this in-situ monitoring approach. 2) Demonstrate feasibility of the multi-parameter imaging approach using the fabricated sample with known defects, as well as demonstrate sensor integrated to ground based AM.

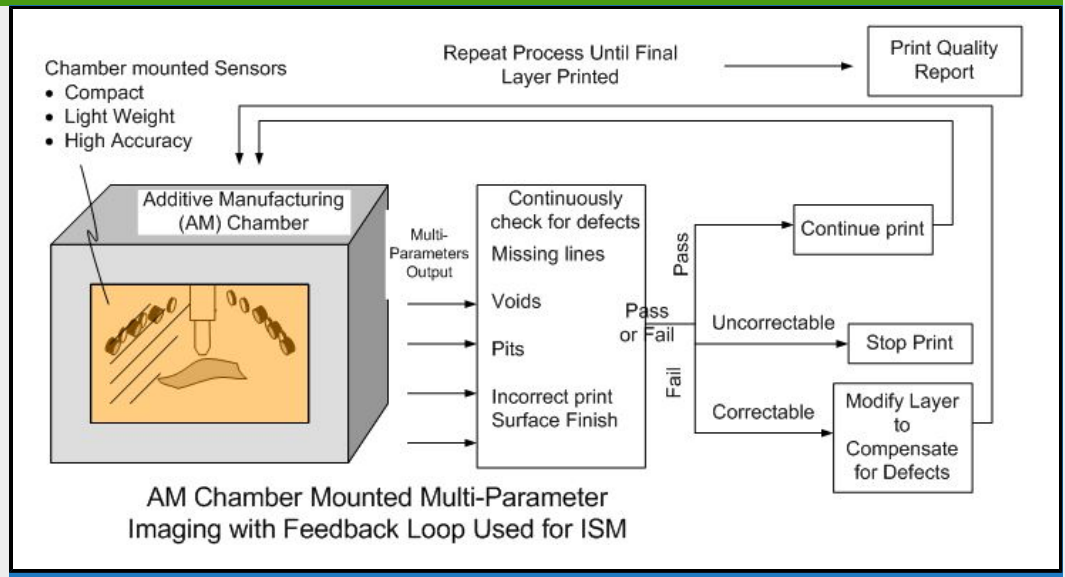
To following plan is used to accomplish the work: A) Design and Fabricate Sample with Known Defects; B) Design, Setup and Perform experiments using the multi-parameter imaging approach, and C) demonstrate the feasibility of each of these approaches both using bench-top tests, correlate the output of the system to predicted outcomes, and D) perform real-time detection with the apparatus mounted in and additive manufacturing machine, testing while the part is being printed.

The proposed deliverables are two interim reports and one final report describing the work, the outcomes and the findings.

TRL

Estimated





AM Chamber Mounted Multi-Parameter Imaging with Feedback Loop Used for ISM

NASA APPLICATIONS

For NASA applications, the proposed innovation will be used for quality control for in-space manufacturing (ISM). An example application is for using in platforms aboard international space station.

NON-NASA APPLICATIONS

For non-NASA commercial applications, this technique can be an add-on quality control and feedback to additive manufacturing units. The economic benefits include reduction of cost of post process testing, and significant reduction of loss of labor and material due to faulty parts.

FIRM CONTACTS

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