

# Method to Maximize Interlayer Bonding in Additive Manufacturing

**Print-speed control method maximizes interlayer bonding strength in additive manufacturing.**

Researchers at Purdue University have developed a method to optimize printing speed for maximum part strength in additive manufacturing. Interlayer bonding is critical for preventing delamination of layers during printing or when subjected to mechanical loads. However, current methods use either a constant print speed or constant time between layers to compute print speeds, which neglect variations in time-temperature history and increase the potential for failure by delamination.

This method helps 3D printing equipment manufacturers and slicing software developers reduce the number of costly and time-consuming print failures commonly experienced with current empirical methods. This innovation decreases the variability in interlayer bonding and the potential for failure by delamination. Furthermore, this method mitigates the need for trial-and-error prints and enhances confidence in producing a successful print the first time. The innovation can be implemented at different stages in the additive manufacturing workflow, such as during the slicing process, as the machine controller, or as a stand-alone pre-processor.

## Technology Validation:

By targeting a specific temperature, the layer time was found to be controlled independent of the layer profile lengths. In separate experiments, targeting substrate temperatures of 180 C and 200 C respectively, the researchers achieved consistent bonding strength.

## Advantages:

- Reduces the need for manual monitoring and adjustment of process conditions
- Mitigates need for trial-and-error prints

## Technology ID

2023-VACA-70152

## Category

Semiconductors/IC Design & EDA  
Tools  
Materials Science &  
Nanotechnology/Composites &  
Hybrid Materials  
Chemicals & Advanced  
Materials/Materials Processing &  
Manufacturing Technologies

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## View online



-Minimizes costly and time-consuming printing errors

**Applications:**

-3D printing companies

-Slicing companies

-Additive manufacturing technology users

**TRL:** 3

**Intellectual Property:**

Provisional-Gov. Funding, 2023-11-10, United States

Provisional-Gov. Funding, 2024-11-20, United States

**Keywords:** additive process optimization, composites additive manufacturing, extrusion deposition additive manufacturing (EDAM), interlayer bonding, Materials and Manufacturing, Mechanical Engineering

# Fast error detection method for additive manufacturing process monitoring using structured light three dimensional imaging

**Fast structured-light imaging detecting additive manufacturing errors in real time with high accuracy.**

Researchers at Purdue University have developed a new method for detecting errors during additive manufacturing (AM) that increases efficiency without sacrificing accuracy. The technology leverages cutting-edge structured light 3D imaging, ensuring high measurement precision and reduced computational complexity. Moreover, the method can greatly increase error detection speed during each successive layer of the AM process, making it easier to analyze full-resolution data from a 3D imaging sensor for a real-time closed-loop AM. With this technology, industries that utilize AM will be able to accurately control the quality of their builds with ease, precision, and speed.

## Technology Validation:

Compared to an existing AM error detection method based on 3D reconstruction and point cloud processing, experimental results from a material extrusion (MEX) AM process demonstrate that this novel method significantly increases the error detection speed.

## Advantages:

- Faster error detection compared to similar existing methods
- Minimized 3D reconstruction reduces computational complexity
- Increased efficiency of additive manufacturing monitoring and error detection
- Cutting edge structured light 3D imaging ensures accuracy

## Applications:

## Technology ID

2025-ZHAN-70848

## Category

Infrastructure &  
Construction/Construction  
Robotics & 3D Printing  
Robotics &  
Automation/Simulation, Digital  
Twins, & Industrial Automation  
Materials Science &  
Nanotechnology/Advanced  
Functional Materials

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## View online



-Additive manufacturing

Publications:

Jack Girard, Song Zhang, "Fast error detection method for additive manufacturing process monitoring using structured light three-dimensional imaging technique," Optics and Lasers in Engineering, Volume 184, Part 1, 2025, 108609, ISSN 0143-8166,  
<https://doi.org/10.1016/j.optlaseng.2024.108609>.

**TRL:** 4

**Intellectual Property:**

Provisional-Gov. Funding, 2024-10-03, United States

**Keywords:** 3D Imaging,3D Printing,Additive Manufacturing,Materials and Manufacturing,Process Monitoring,Quality Control,Structured Light,Error Detection,Real-Time Monitoring,Material Extrusion (MEX),Computational Efficiency,3D Reconstruction,Point Cloud Processing