PURDUE INNOVATES | Office of Technology Commercialization

Smart Resin Vat: Real-time Detecting Failures, Defects, and Curing Area in Vat Photopolymerization 3D Printing

Smart resin vat with in-situ thermistor array detects failures and defects in real time during vat photopolymerization.

Researchers at Purdue University have developed a method of detecting real time failures, defects, and curing area in the vat photopolymerization 3D printing process. Printing failures, defects, and thermal distortion are still challenging all the vat photopolymerization (VPP) technologies, and previous attempts at monitoring the process (separation force sensors, cameras) were unsuccessful. The Purdue researchers' method utilizes an array of thermistors to monitor and collect in-situ real-time temperature data, without affecting the printing. By using the data collected, this method is able to predict the printing area and shape. This method seeks to overcome feature loss and distortion, which is very common in VPP.

Technology Validation: The researchers created a machine learning model to determine the printing status for any vat configuration or polymerization process. The researchers trained, validated, and tested their model using the data set collected by printing six parts. The model successfully detected printing failures, manual printing pause, and missing features.

Advantages

- real-time monitoring

- in-situ

- low cost

- amenable to different types of vat photopolymerization processes

Applications

- monitoring of photopolymerization 3D printing

Technology ID
2022-MAO-69748

Category
Artificial Intelligence & Machine Learning/AI-Integrated Imaging Systems & Industrial Vision and Inspection
Chemicals & Advanced Materials/Materials Processing & Manufacturing Technologies

Authors
Huachao Mao
Yujie Shan

Further information
Parag Vasekar
psvasekar@prf.org

View online

TRL: 2

Intellectual Property:

Provisional-Patent, 2022-04-29, United States

Utility Patent, 2023-02-28, United States

Keywords: Machine Learning, Materials and Manufacturing, Real-time detection, Smart resin vat, Vat photopolymerization