Collection and Analysis of Additive Manufacturing Signatures for Proliferation Detection

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Abstract:

Rising concerns about the potential misuse of Additive Manufacturing (AM) technologies for nuclear proliferation emphasize the need for effective detection methods. In response, this research project introduces the development of an AM Signatures Database, covering seven primary AM processes with distinctive material and process properties. These properties, including material operating temperature, type, built part density, feedstock material density, average particle size, build envelope temperature, operating gas, deposition rate, and part surface hardness, form the basis of the database. The database is publicly accessible on the Texas Data Repository and undergoes continuous updates to maintain transparency and reliability.

Future work focuses on developing an automated web tool to operationalize the database, facilitating the comparison of detected AM signatures with established descriptors to determine a likely AM process, expanding the database, and introducing additional material-specific signature categories. The overarching objective is to empower the web tool with predictive capabilities, allowing confident identification of the responsible AM process for fabricating a given part.

In summary, this research offers a proactive solution to address concerns associated with AM technologies by presenting the AM Signatures Database and an accompanying automated web tool. These tools verify detected signatures and align with broader initiatives to ensure the responsible and peaceful use of additive manufacturing across diverse industries.