New X-ray Technology Improving 3D Printing

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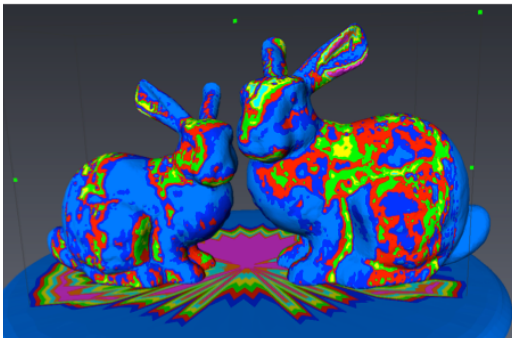
What is the outcome or accomplishment?
Sometime in the near future, it will be possible to print out a plastic and metal electronic device, like a phone charger, on a 3D printer. The ability for researchers to analyze materials with similar contrast, like plastic and metal alloys, will be vital to developing better 3D printers.

Louisiana State University's new world-class X-ray imaging tool, called an interferometer, is giving researchers the ability to see surface defects and complex structures within objects made out of materials with similar contrast without destroying the object.



Two copies of the "Stanford Bunny," a 3D test computer model developed by researchers at Stanford, have been printed in plastic from a 3D printer. The image coloring represents the dimensional error between the print file and the plastic bunnies measured with X-ray tomography.
Credit: Dr. Les Butler, Louisiana State University

What is the impact?
Improvements in 3D printer technology will produce structurally stronger objects in less time, which is important for industrial and manufacturing applications.

Improved printer accuracy is imperative for highly sensitive 3D printing applications, such as custom medical implants or replacement parts printed aboard the International Space Station.

Instrument team members at the LSU CAMD tomography/ interferometry beamline. Pictured, left to right: Dr. Kyungmin Ham, Mr. Bolaji Olatinwo, Mr. Gerry Knapp, Dr. Les Butler, and Don Patterson.

Credit: Dr. Les Butler, Louisiana State University

What explanation/background does the lay reader need to understand the significance of this outcome?
A traditional X-ray image shows structures like bones very well, but it does not have good contrast resolution for structures that absorb X-rays at a similar rate, like soft tissues. The X-ray interferometer system is unique because it simultaneously creates three images: 1) the traditional shadow X-ray image that measures the absorption of X-ray energies, 2) a phase-contrast image, which measures the phase shift changes of the X-ray beam as it bends while passing through the object, and 3) a dark field image showing the effect of X-rays scattered by extremely small defects in the object.

Dr. Les Butler, Professor of Chemistry at Louisiana State University is leading a team of researchers developing computational analysis tools and testing the new interferometer at LSU's Center for Advanced Microstructures and Devices (CAMD). The trio of images produced by the new X-ray interferometer has the potential to greatly transform the future of medical and material imaging.