



How Generative Restoration is Reimagining Korean Cultural Heritage

Project R's 3D Printing
Innovation with Stratasys
PolyJet™ Technology



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Stratasys' PolyJet 3D printers are capable of progressively mixing and matching multiple materials in one object, making it possible to create designs that look exactly like what you see on the screen. I think the PolyJet 3D printer is a very versatile device that can express anything.”

Professor Ahn Sung-mo
Seoul National University



Ceramic assembly process
with 3D printed part.

Customer Profile

The Project R team, comprising professors from Seoul National University and Kookmin University, made a remarkable presentation at the 2023 Cheongju Craft Biennale with their innovative “generative restoration” technique using PolyJet™ 3D printing. This pioneering approach not only repairs but also reimagines traditional Korean ceramics, merging history with cutting-edge technology to create contemporary art.

Project R is a collaborative initiative led by Professor Ahn Sung-mo, Department of Design at Seoul National University, Professor Jeong Jin-won, Department of Ceramics and Crafts at Kookmin University, and Professor Yoon Sung-ho, Department of Chemistry at Chung-Ang University.

(Sung-Mo’s workshop at Seoul National University)
The team is renowned for integrating chemical analysis, traditional Prof. Ahn craftsmanship, and digital technology in their research on artifact creation and restoration.

Project R approaches ceramic restoration with a unique vision. It transforms traditional Korean ceramic fragments, known as “doeps,” which are often found incomplete, into modern art.

(Ceramics with polyjet-restored parts glued to broken shards)

Contrasting with the labor-intensive traditional

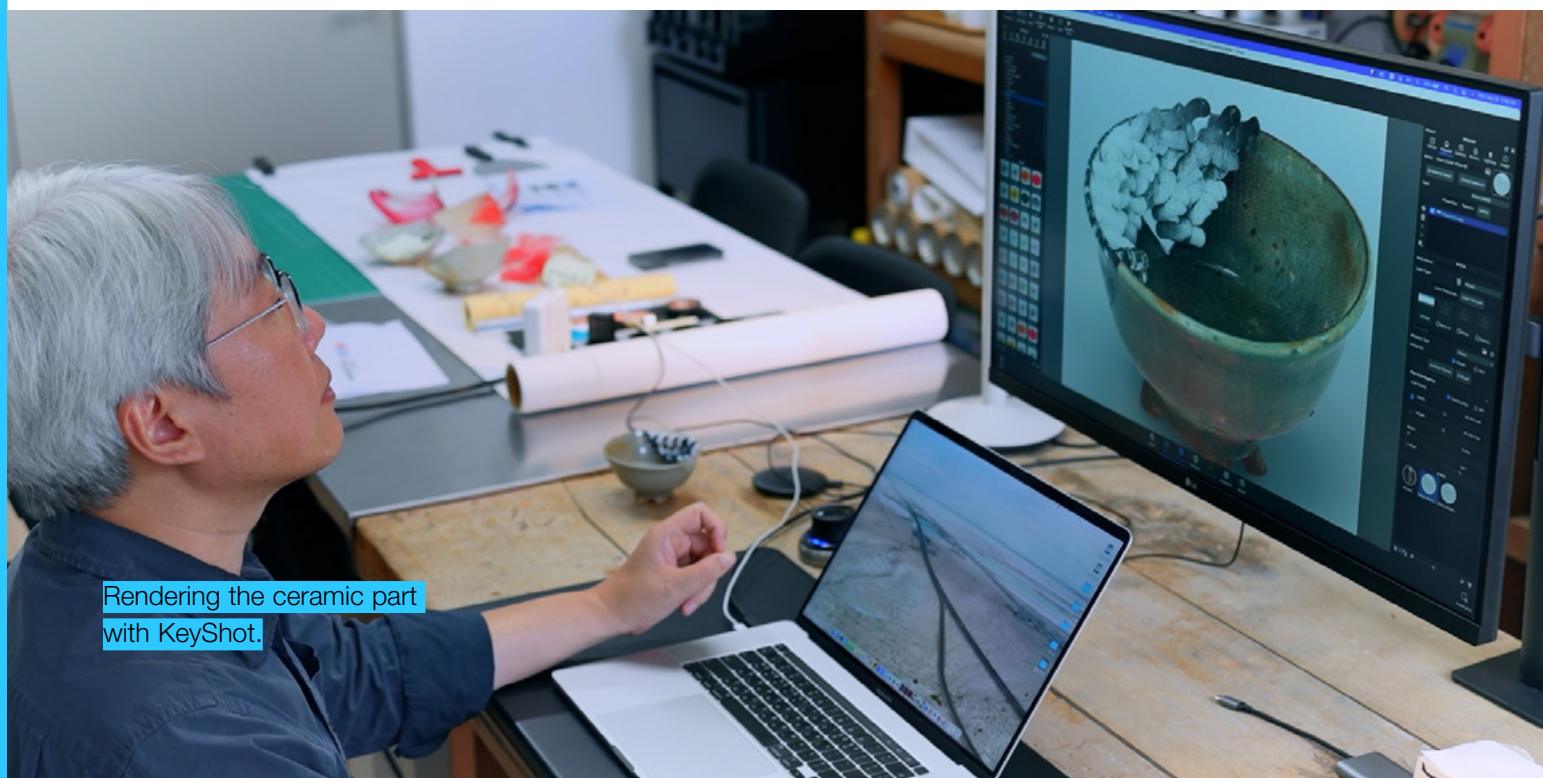
methods that involve piecing together, cleansing, and manually reconstructing with adhesives and pigments, Project R’s process infuses contemporary significance into these artifacts, re-envisioning them through a modern artistic lens while preserving the craftsmanship of skilled restorers.

Challenge

Traditional restoration of ceramics is painstaking and time-consuming, focusing on the repair of physical damage without considering the artifact’s historical context or potential for contemporary reinterpretation. Project R sought to overcome this limitation by restoring the original value of the ceramics and allowing them to “self-heal,” akin to living organisms.

Project R’s mission is the pursuit of “generative restoration,” a process that seeks to blend the historical essence of old ceramics with a new creative spirit. This innovative restoration method goes beyond mere repair to enable the piece to reclaim its form naturally, mirroring the self-healing process found in living organisms.

By analyzing the ceramic’s historical creation process and employing 3D technology, generative restoration allows the artifact to evolve, acquiring new aesthetic and functional forms while honoring its original craftsmanship.



Rendering the ceramic part with KeyShot.

Solution

To create the piece for the 2023 Cheongju Craft Biennale, Project R harnessed the precision of Stratasys PolyJet 3D printers to merge the past with the present.

The digital restoration of ceramics using 3D printing is straightforward. A 3D scanner captures a digital image of the broken fragments, and these digitized shards are then processed in KeyShot, a 3D rendering program, employing UV mapping to apply specific colors, textures, and finishes. The completed design is saved in 3MF format and moved to GrabCAD Print™ for a three-dimensional print preview.

The final step involves the Stratasys PolyJet 3D printer, which prints a physical sculpture that precisely fits the original ceramic piece, achieving a seamlessly restored artifact. This method exemplifies the elegant application of digital technology in the restoration of fractured ceramics.

This process, from scanning to printing, ensures a seamless integration of old and new, culminating in a restored piece that stands as a testament to both its history and the possibilities of modern technology.

Business Impact

Project R's pioneering work has significant implications for both the preservation of cultural heritage and educational advancement.

Professor Ahn plans to use Stratasys 3D printers and accompanying software to take education to the next level. His focus is on 'prototyping' — the creation of a preliminary model prior to the final product.

The true educational value of additive manufacturing emerges as it expands beyond mere prototyping, offering students the chance to delve into innovative fabrication techniques and complex designs previously unattainable.

Professor Ahn believes that the PolyJet 3D printing technology from Stratasys will greatly enhance creative experimentation, enriching and innovating design education and research at the university level.

The team's success with their generative ceramic restoration using 3D printing was a highlight at the 2023 Cheongju Craft Biennale, showcasing how digital technology can not only restore but also enhance the value of cultural artifacts.

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The PolyJet 3D printer allows us to combine the existing ceramic pieces with the newly created parts, and to accurately simulate transparent parts using different materials. This could only be achieved with PolyJet and has helped us tremendously in the creation of our pieces.

Professor Ahn Sung-mo
Seoul National University



Rendered part which is
generatively created.



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