Mosaic techniques are thought to be as old as the ancient ziggurats of Mesopotamia—and equally as labor intensive. “In the early history of mosaic production, artists would design and slaves would implement,” says Paul Reiss, co-founder of Boston-based mosaic fabricator Artaic. As it happens, the modern term robot is derived from the ancient Slavic words for drudgery and slavery. So perhaps it was only a matter of time before someone—in this case, Artaic—built a labor-saving robot that automates the assembly of mosaics. After juror Lawrence Scarpa deemed this project a “natural” application of existing robotic technology, he asked, “Why didn’t I think of that?”

In 2007, Artaic began developing software and a robotic arm to automatically—and quickly—assemble tile mosaic walls and floors based on any image. The designer or client begins by selecting or generating a digital image along with the desired tile palette. Artaic’s software then translates the image into pixels that will correspond to each physical mosaic tile of a given color and size. Similar to painting by numbers, the robot in Artaic’s shop picks up and positions the corresponding, individual mosaic tile into a square-foot grid. With a placement rate that Artaic claims can exceed one tile per second, the feed system for the automated tile assembly “is a tricky, interesting beast,” juror Bill Zahner said.

The square-foot grids are turned into mosaic tile sheets, which are then shipped to the project site and assembled into the full, seamless image. Producing the tiles for a mosaic mural at Iowa State University measuring 75 feet long by 18 feet tall took about two weeks, according to the company.

The visual complexity of an Artaic mosaic is limited only by the size and color of the individual mosaic tiles available. The company currently offers tiles in three types of glass, plus stone and unglazed porcelain. Most come as half-inch or 1-inch squares, although the vitreous glass tiles come as small as ¼-inch square. Designers have no shortage of color options for the glossy- or matte-finished tiles: about 50 hues for each type.
Artaic's robot, which is named Arty, picks up and assembles individual mosaic tiles into 1-square-foot grids that are derived from the tesselated image file created in the company’s software. These grids of tiles are then anchored to backing to become a mosaic tile sheet. One large mosaic can comprise roughly 1,500 such sheets, which are installed on site.
Making Grant
Taubman College of Architecture
Providence, R.I.—Alex Belykh
Galvanique, Electroform Consultant
Assoc. AIA, John Guinn
Nathan Doud, Research and Design Team

Beaucé (associate professor, École Supérieure Jean Louis Farges (principal, Akoaki), Patrick and Urban Planning, University of Michigan), professor, Taubman College of Architecture
Anya Sirota (assistant
Primary Investigators

Ann Arbor, Mich.

Design Firm
Archolab, Ann Arbor, Mich.

Project
EcologicaLism

Morphfaux

Project
Morphfaux

Design Firm
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Primary Investigators
Steven Mankouche, Joshua Bard, Matthew Schulte

Project Team
Claire Sheridan, Michael Senkow, Andrew Thompson, Richard Tursky, Jono Sturt, Robert Yuen, Eifie Frieldander

Consultants

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EcoMod

Project
EcoMod South: High Performance Affordable Housing

Client
Southside Outreach, South Boston, Va.—Earl Howerton, Earlene Powell; People Inc., Abingdon, Va.—Mike Rush, Michael Weaver

Primary Investigators
University of Virginia, School of Architecture, School of Engineering and Applied Science

Project Team
John Quale (associate professor and EcoMod project director); Michael Britt, AIA (project manager); Elizabeth Rivard, Assoc. AIA, Erik de los Reyes (research assistants: architecture); Beth Bailey (research assistant: landscape architecture); Barbara Gehring (Passive House consultant); Paxton Marshall (engineering director); Nancy Takahashi (landscape architecture adviser); Eric Field (digital simulation adviser); Galen Staengl (engineering (mechanical design); Phil Parrish (associate vice president for research)

Prototype Design Team
The EcoMod South design is based in part on EcoMod4, a modular home completed in 2009 for Habitat for Humanity of Greater Charlottesville; the design and construction team included more than 70 architecture, engineering, landscape architecture, planning, and commerce students.

Off-Site Construction
Cardinal Homes, Wyliesburg, Va.—Bret Berneche (president)

On-Site Construction
Allen Stevens Construction (site in South Boston, Va.); People Inc., C.W. Denton Construction (site in Abingdon, Va.)

Funding
Tobacco Indemnification and Community Revitalization Commission of Virginia

Innovative Mosaic

Project
Innovative Mosaic

Design Firm
Artaic, Boston

Primary Investigator
Paul Reiss (co-founder and creative director)

Research and Design Team
Ted Acworth (founder and CEO), Blake Goodwin (director of operations)

AEC-Apps

Project
AEC-Apps (aec-apps.com)

Design Firm
Skidmore, Owings & Merrill, New York; Case Design, New York

Project Leaders
Nicholas Holt, AIA (director, Skidmore, Owings & Merrill); David Fano (partner, Case Design)

Project Team
Skidmore, Owings & Merrill—Jason Chen, Robert Yori, Assoc. AIA, Robert Mencarini, AIA, Nick Scalco; Case Design—Mike McDearmon, Angel Ceballos, Jose Capelan, Diego Sapriza, Jorge Sierra

NUM NUM Flatware

Project
NUM NUM Flatware

Design Firms
NADAAA, Boston; Office dA, Boston

Principal in Charge
Nader Tehrani

Project Coordinators
Brandon Clifford, Parke MacDowell

Project Team
Catie Newell, Monica Ponce de Leon, AIA

Fabricator
NADAAA (R+D prototyping); GPI Prototype and Manufacturing Services (metal prototyping)

Wireless Sensor Network

Project
Wireless Sensor Network

Design Firm
KieranTimberlake, Philadelphia

Project Team
Roderick Bates, Richard Clark, Peter Curry, Eric Eisele, Billie Faircloth, AIA, Stephen Kieran, FAIA, Taylor Medlin, Alex Roscoe, James Timberlake, FAIA, Ryan Welch

Green Roof Vegetation Study

Project
Green Roof Vegetation Study

Design Firm
KieranTimberlake, Philadelphia

Project Team
Roderick Bates, Stephanie Carlisle, Billie Faircloth, AIA, Stephen Kieran, FAIA, Taylor Medlin, Assoc. AIA, Max Piana, James Timberlake, FAIA, Ryan Welch