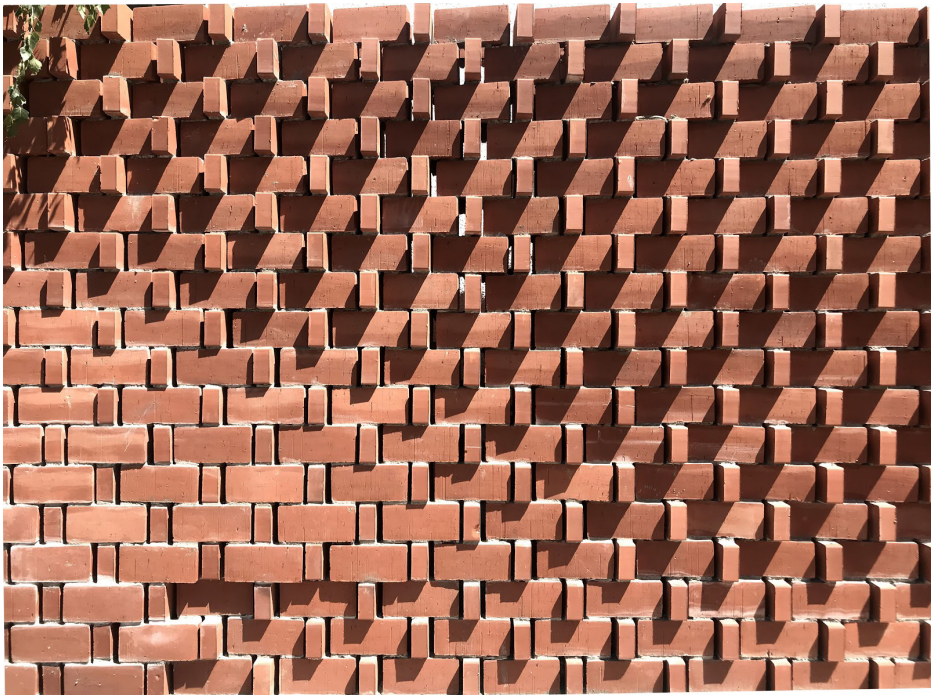
Technische Universität München
Department of Architecture
Design Theory

Climate Active Bricks – How robotic fabrication technology can contribute to improving urban microclimates

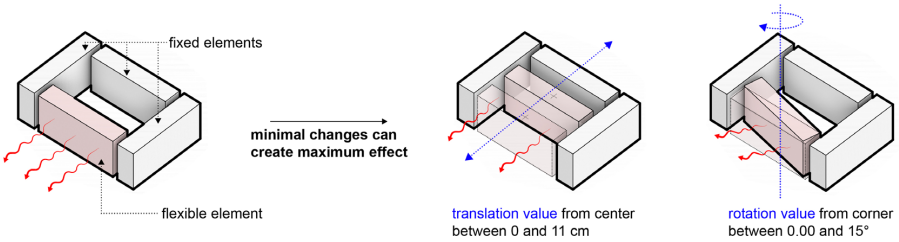


Re-imagining facade design
Climate change will have a severe impact on human wellbeing and health, especially in dense, urban environments. With the increase of extreme weather phenomena, such as prolonged heat periods, urban streets will become important urban arenas to counter climate change's effects on a city's population.

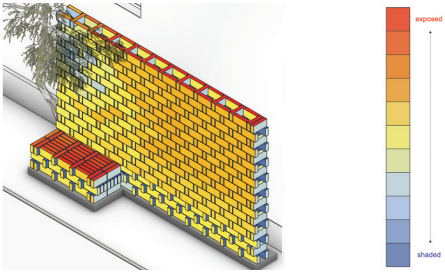
The Climate Active Bricks project aims to develop solutions for retrofitting urban facades towards climate resilience and livability, leading to the creation of highly customized and site-specific architectural solutions. As an interdisciplinary effort, it combined knowhow and expertise from the fields of architecture, robotic fabrication, and climatic science, combining three TUM departments.

At its core, the project investigated the impact of self-shading building structures and the resulting reduced solar exposure and heat storage on the surrounding microclimate and perceived human comfort level. This was achieved by applying digital design & robotic fabrication technology to 1) design an optimised structure based on the specific location and solar exposure of a building and 2) build the structure with precision only achieved by human-robot collaboration.

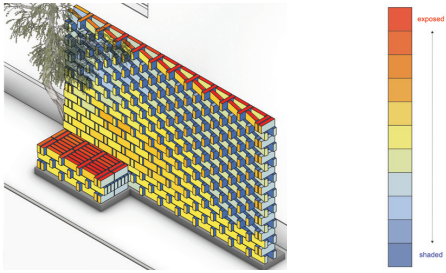
As the constructed prototype shows, the project is also exemplary for seamless links between simple and straightforward design ideas; and it harnesses the opportunities that technological innovations offer. This fosters open access to digital tools and, thus, the application of technology to architecture where it can be the most effective.



The rat-trap bond, a brick wall masonry construction method. While the side headers remain fixed, two parameters of the front stretcher—rotation and translation—could be modulated in order to create a self-shading effect and



A regular flat facade. The color red indicates exposed, heated-up areas in the wall as a result of radiation



A facade where the front bricks of the bond have been rotated and translated to the back to create a self-shading effect.

Group Members

Technical University of Munich
TUM Department of Architecture

Professorship of Digital Fabrication
Prof. Dr. sc. ETH Kathrin Dörfler
Dipl. Ing. Julia Fleckenstein

Associate Professorship of Architectural Design and Building Envelope
Dr.-Ing. Architekt Philipp Lionel Molter

Climateflux
Ata Chokhachian, MSc

Technische Universität München
Department of Architecture
Design Factory 1:1
Schwere-Reiter-Straße 2h / Halle 29
80636 München
https://www.arc.ed.tum.de/defac

TUM.wood Gruppe

Students

Daria Alekseeva, Maurice Demeyer, Arvand Vaghari Fard, Robin Feys, Georgy Frolov, Arno Gabriel Goedefroo, Iuliia Larikova, Shiran Potié, Sébastien Wilwers

Special thanks to

Chair of Building Technology and Climate Responsive Design,
TUM Department of Architecture

Chair of Geodesy,
TUM Department of
Aerospace and Geodesy

Leipfinger Bader Ziegelwerke

Empfangshalle