

Emerging Earthen Architecture

Digital Design and Fabrication for Building with Earth

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Abstract

Building with earth is an ancient craft still used worldwide. Yet, in the twentieth century, earth lost its popularity to industrialised materials and started to be acknowledged as a primitive material. This research aims to promote the virtues of building with earth to mitigate the impact of the construction industry on the environment. The research focuses on digital design and fabrication for building with earth to investigate an emerging earthen architecture which can provide efficient, healthy, attractive, affordable and customised buildings of the future. In the age of Industry 4.0 and aspirations for a circular economy, automated construction and mass customisation are replacing conventional construction and mass production while reusable, low carbon materials such as earth should replace conventional materials with high embodied energy such as concrete. The advancement of computational design, additive manufacturing and robotic automation along with a novel understanding of materiality creates the juxtaposition of high technology with the most ubiquitous and humble material in the world.

Main Research Questions:

1. How can we enhance conventional design and manual construction of earthen buildings with computational design, additive manufacturing and automated construction?
2. By using material based design computation, can we improve the structural and thermal qualities of earthen buildings and develop a 3D printable spatial design vocabulary to create a variety of building programs such as houses or schools with a customised and democratised approach?
3. How can on-site additive manufacturing with earth can reach a wider audience as a local, collaborative, affordable and low-carbon construction process?