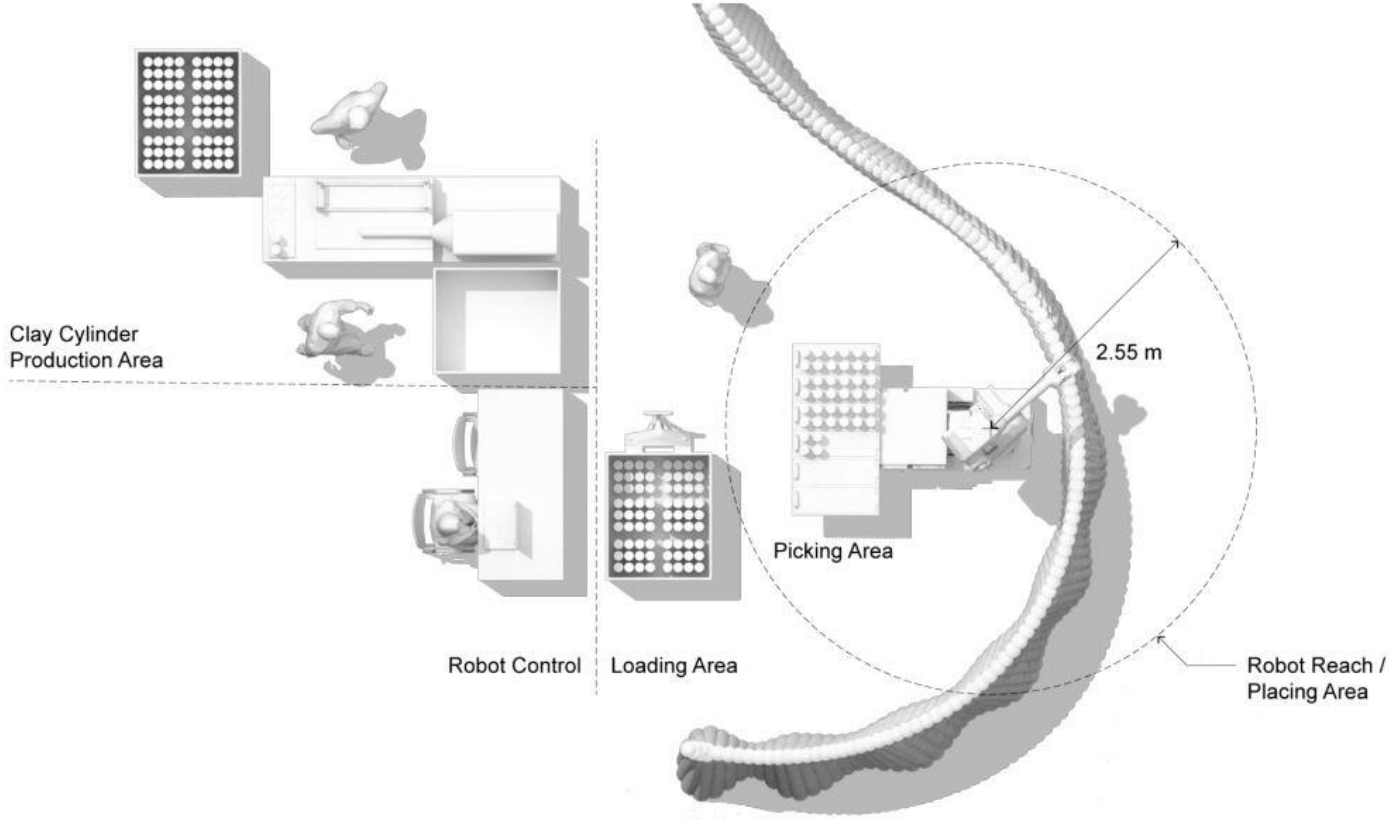
Digital Dishes; Research

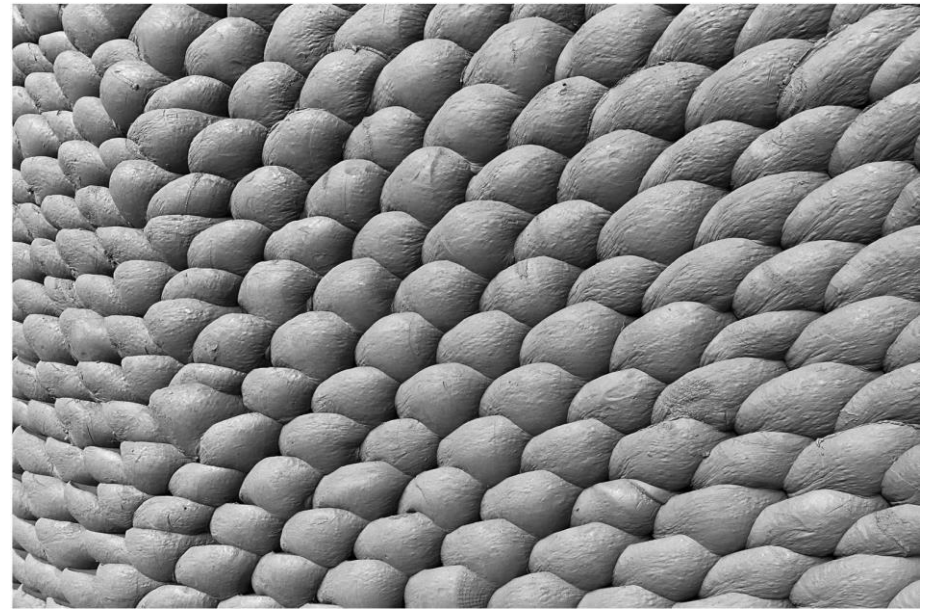
Rapid Clay Formation

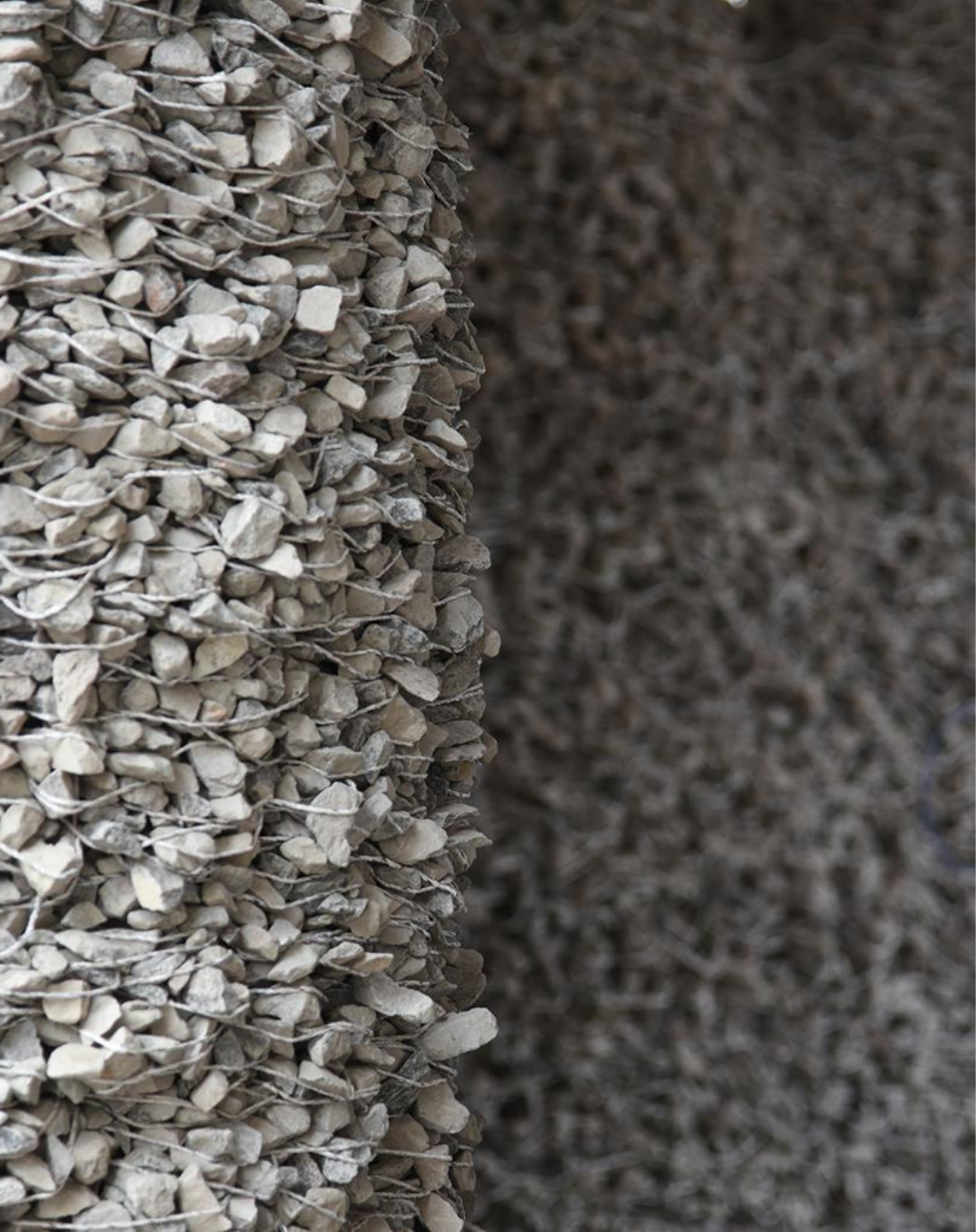
Rapid Clay Formations (RCF) is an ongoing research project investigating robotic aggregation of soft clay elements. This thesis presents our research into RCF construction on an architectural scale.
It outlines our development of a fabrication process suitable for the construction of tall and slender structures made out of clay. This fabrication process is evaluated through a series of prototypes and preparations for a three week building workshop.
In our development we have evaluated and tested material behaviour and optimization, geometric sensing, robot trajectory planning and mobile robotic localization. These explorations are combined with design studies for large monolithic clay structures aimed at a rapid construction on site.

Fig. 18 *Pick and place tool*

Fig. 19 *Extrusion and cutting station*

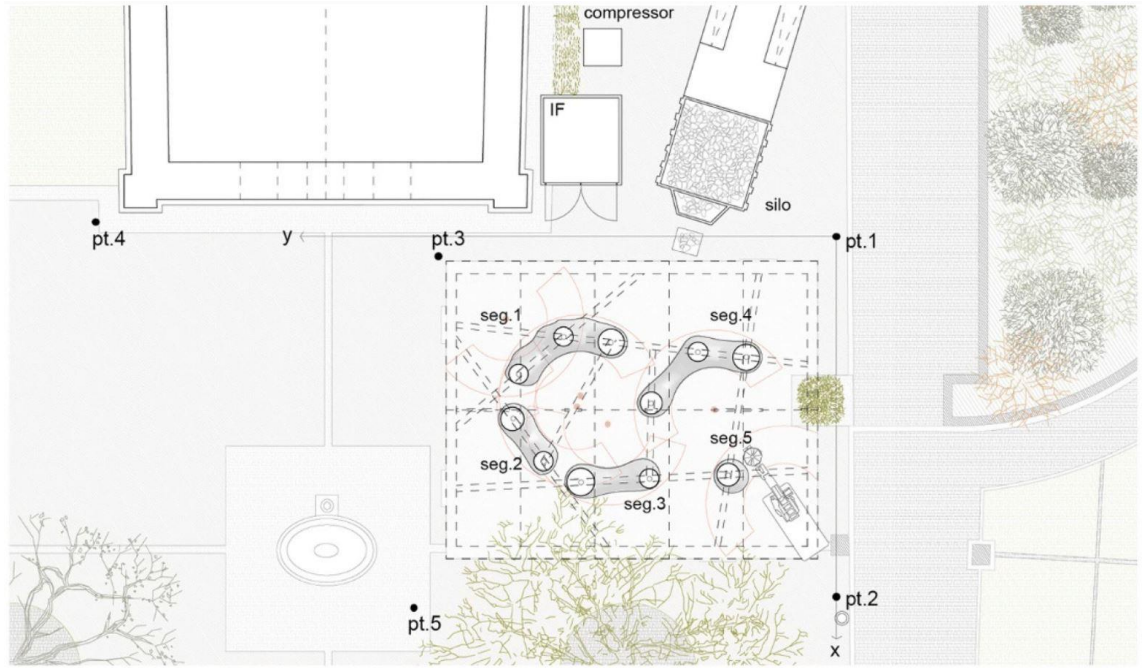






Rock print Pavilion

In this paper, we present novel techniques and tools for mobile robotic in situ fabrication of fibre reinforced granular structures outdoors. The research focuses on Jammed Architectural Structures (JAS), a material system that combines granular jamming with strategically placed reinforcement creating robust yet fully reversible structures from crushed rock and string. An architectural implementation of robotic fabrication of JAS requires research on the material system to optimize fabrication speed and on the robotic fabrication method to adapt it for mobile robotic fabrication on uneven ground. There is also a need for building strategies to protect the structure from weathering and making it safe for the public. A novel robotic fabrication method with a fabrication speed that is acceptable for experimental construction and enables fabrication of building-scale dimensions on uneven ground is presented. The presented research consists of three experiments: a column built with a novel reinforcement pattern, a wall element built with a novel end-effector and a building that incorporates the findings from the two first experiments built in situ outdoors with a mobile robot. The conclusion is that robotic fabrication of JAS is suitable for outdoor constructions, that it can be used to create enclosed space that is geometrically articulated and allows for openings and that it is suitable for structural and load-bearing elements. Finally, future work on how to increase the lifespan of the material system and how to increase the fabrication speed further is outlined and discussed.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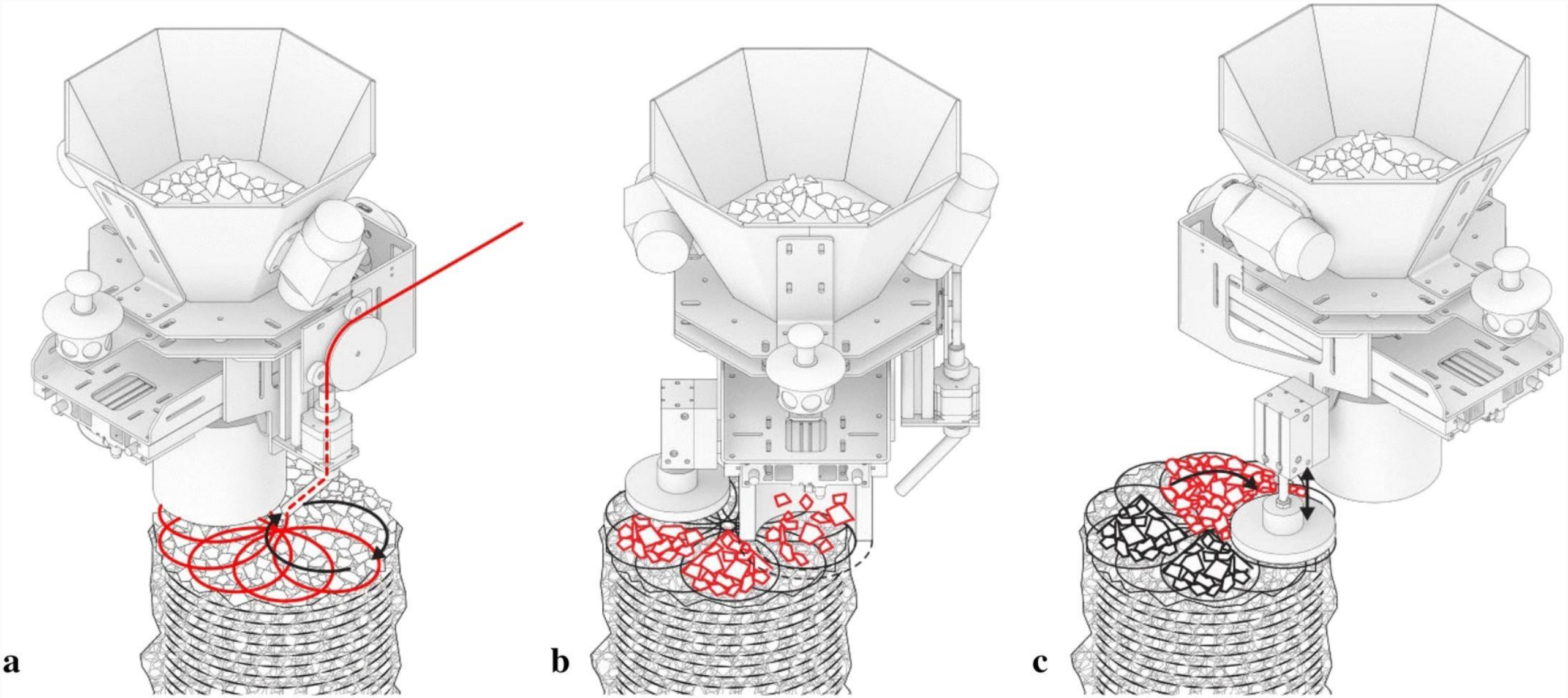
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Digital Dishes; Experiments


Digital Dishes; Experiments


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