

Robot-Aided Fabrication of Interwoven Reinforced Concrete Structures

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Abstract. This paper focuses on the realization of three-dimensionally interwoven concrete structures and their design process. The output is part of an ongoing research in developing an innovative strategy for the use of robotics in construction. The robotic fabrication techniques described in this paper are coupled with the computational methods dealing with geometry rationalization and material constraints among others. By revisiting the traditional bar bending techniques, this research aims to develop a novel approach by the reduction of mechanical parts for retaining control over the desired geometrical output. This is achieved by devising a robotic tool-path, developed in KUKA^{lprc} with Python scripting, where fundamental material properties, including tolerances and spring-back values, are integrated in the bending motion methods via a series of mathematical calculations in accord with physical tests. This research serves to demonstrate that robotic integration while efficient in manufacturing it also retains valid alignment with the architectural design sensibility.

Keywords: Robotic fabrication · Robotic bar bending · Concrete composite · Geometry optimization · Polypropylene formwork.