Chair of Computational Modeling and Simulation
TUM Department of Civil, Geo and Environmental Engineering
Technical University of Munich

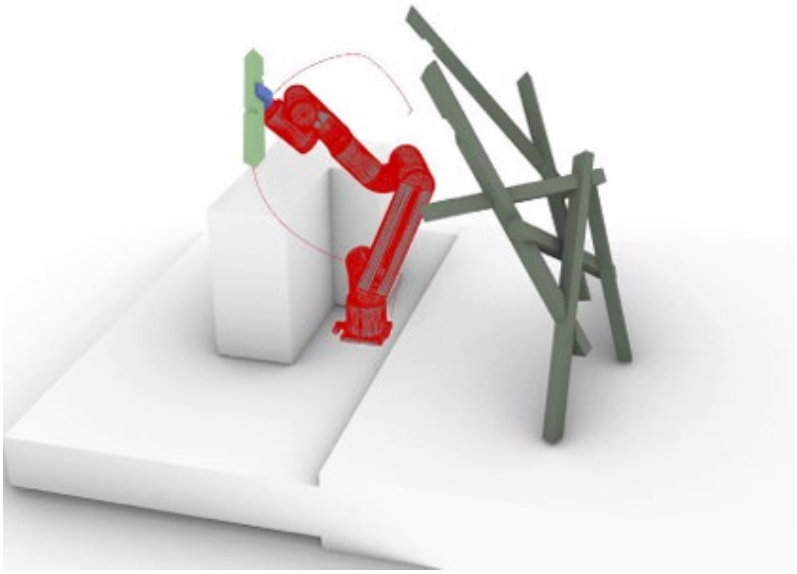
Master Thesis Proposal

Robotic Task and Motion Planning for Installing Steel Structures

Description

This research advances the automation of building construction by developing a computational workflow for robotic assembly of steel frame structures. The project leverages a Grasshopper-based parametric design framework that seamlessly integrates Rhinoceros 3D modeling software with the Robot Operating System (ROS) through COMPAS FAB, enabling real-time planning, simulation, and control of complex assembly operations.

The thesis will include creating a parametric design of the steel structure and developing algorithms for robot planning, collision avoidance, and adaptive manipulation, allowing the robot to autonomously position, and join steel elements. This research aims to implement robotic fabrication processes for complex architectural structures to enhance precision and efficiency in automated construction.



Simulation Environment

The environment for this project is the Grasshopper tool integrated with Rhino 3D, which allows users to design complex geometries through a node-based, intuitive interface. Furthermore, COMPAS FAB is a robotics framework within the COMPAS ecosystem, designed for robotic fabrication and simulation in architecture.

Supervisors

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References

[1] human–robot cooperative workflow for assembling wooden structures using rope joints

[2] COMPAS FAB