Planning Non-repetitive Robotic Assembly Processes with Task and Motion Planning

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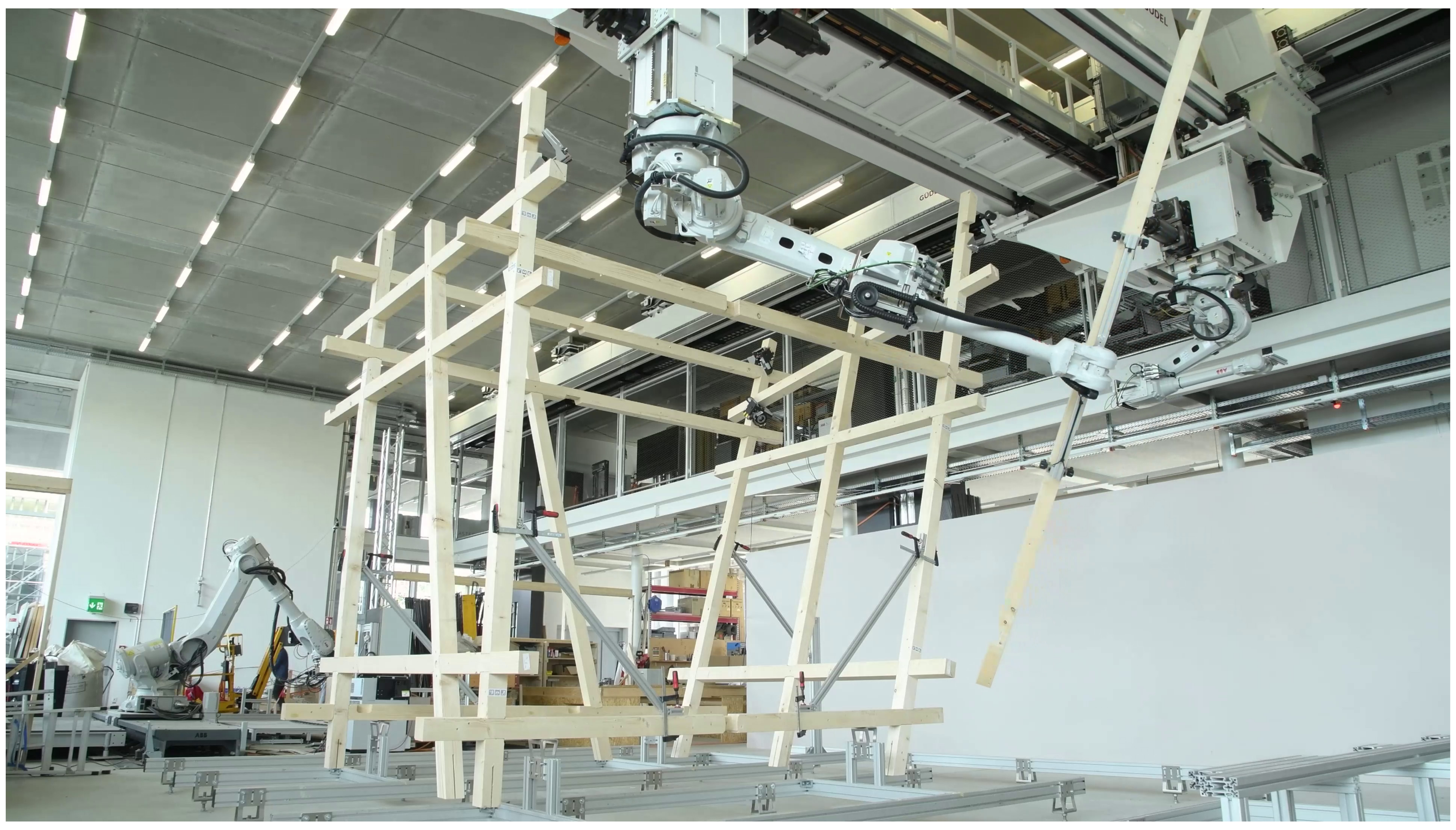


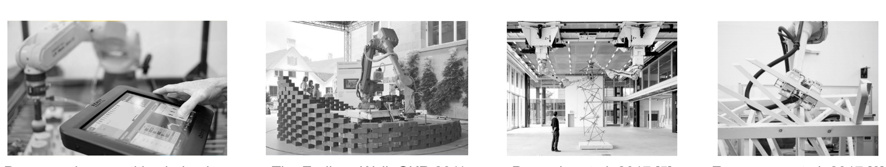
Introduction

Task And Motion Planning (TAMP) methods promise to simplify robot programming efforts in architectural construction by automatically generating optimized actions from high-level goals and action descriptions. However, due to the domain knowledge gap, converting construction intention to TAMP solver remains challenging [1,2,3].

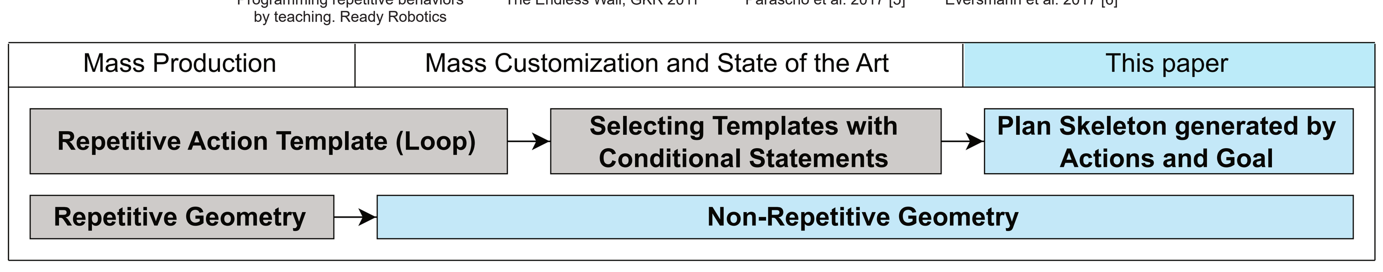
In this work, we show:

- **an incremental programming approach to encode a construction assembly process for PDDLStream [4], a TAMP solver**
- **automatic generation of action plans with significant execution time reduction without manual programming efforts**
- **real-world deployment for assembling a real-scale timber structure**

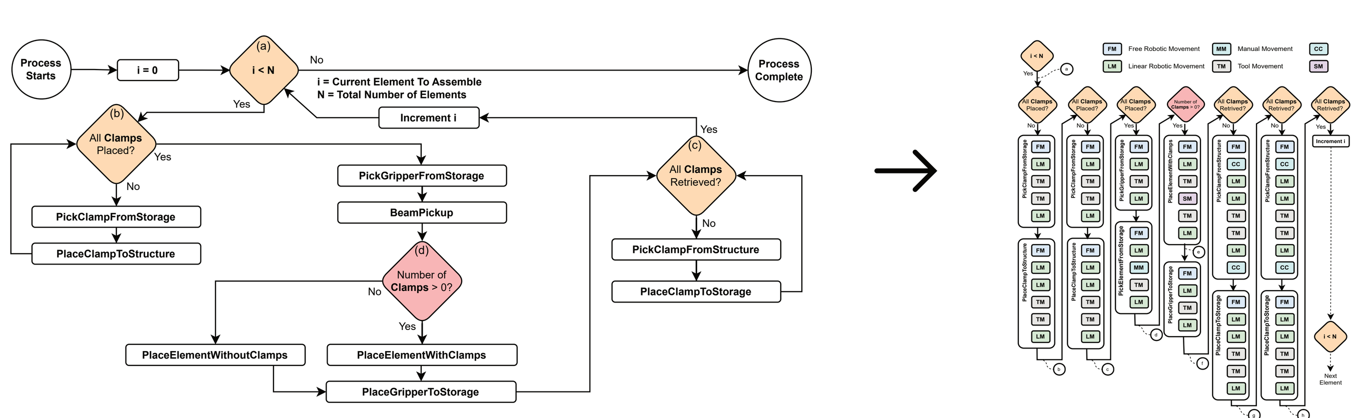
These results show that through TAMP, we can achieve **modular and reusable domain modeling and planning** that can be easily extended to address new fabrication processes and associated constraints.

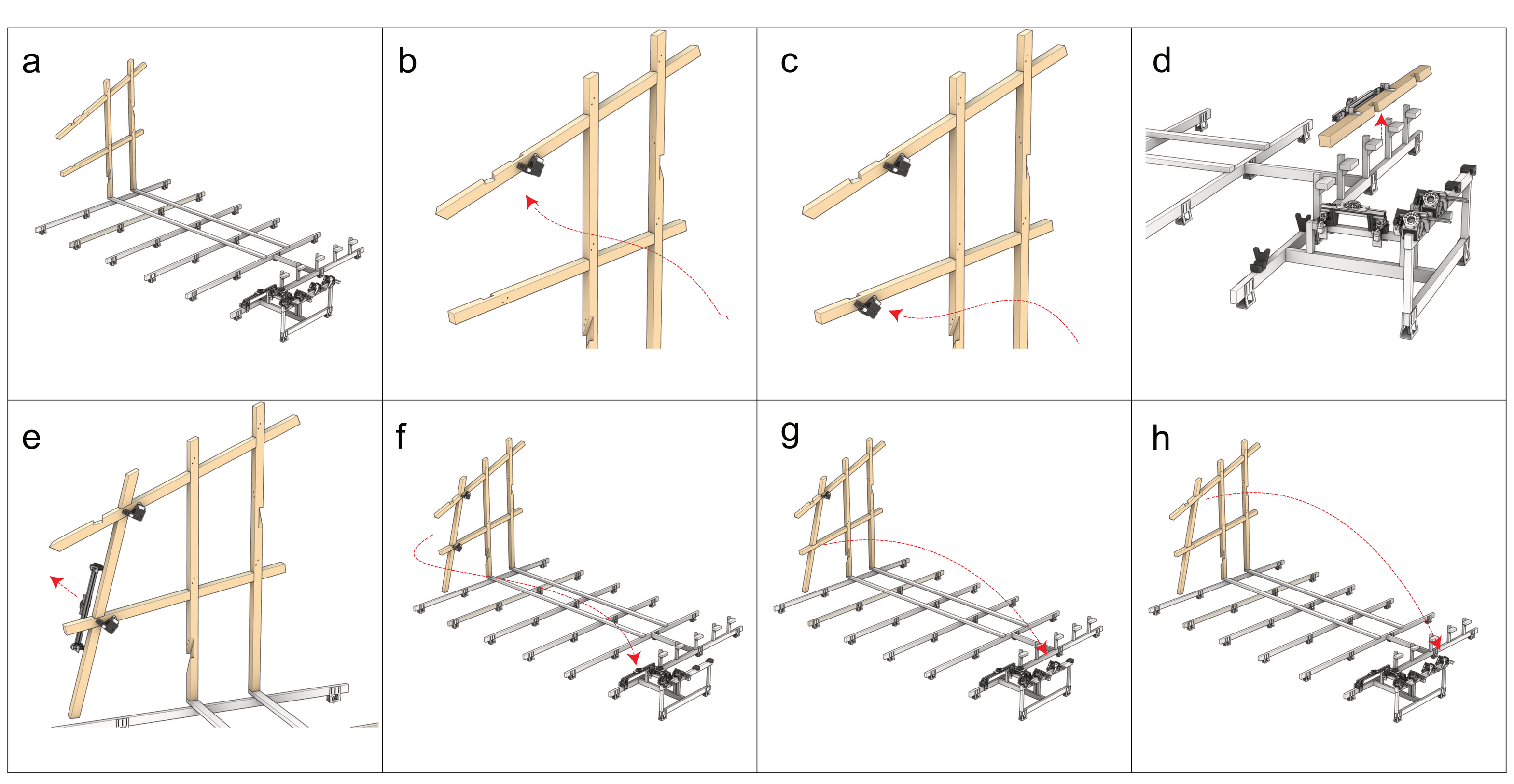


Programming repetitive behaviors by teaching. Ready Robotics | The Endless Wall, GKR 2011 | Paraschо et al. 2017 [5] | Eversmann et al. 2017 [6]

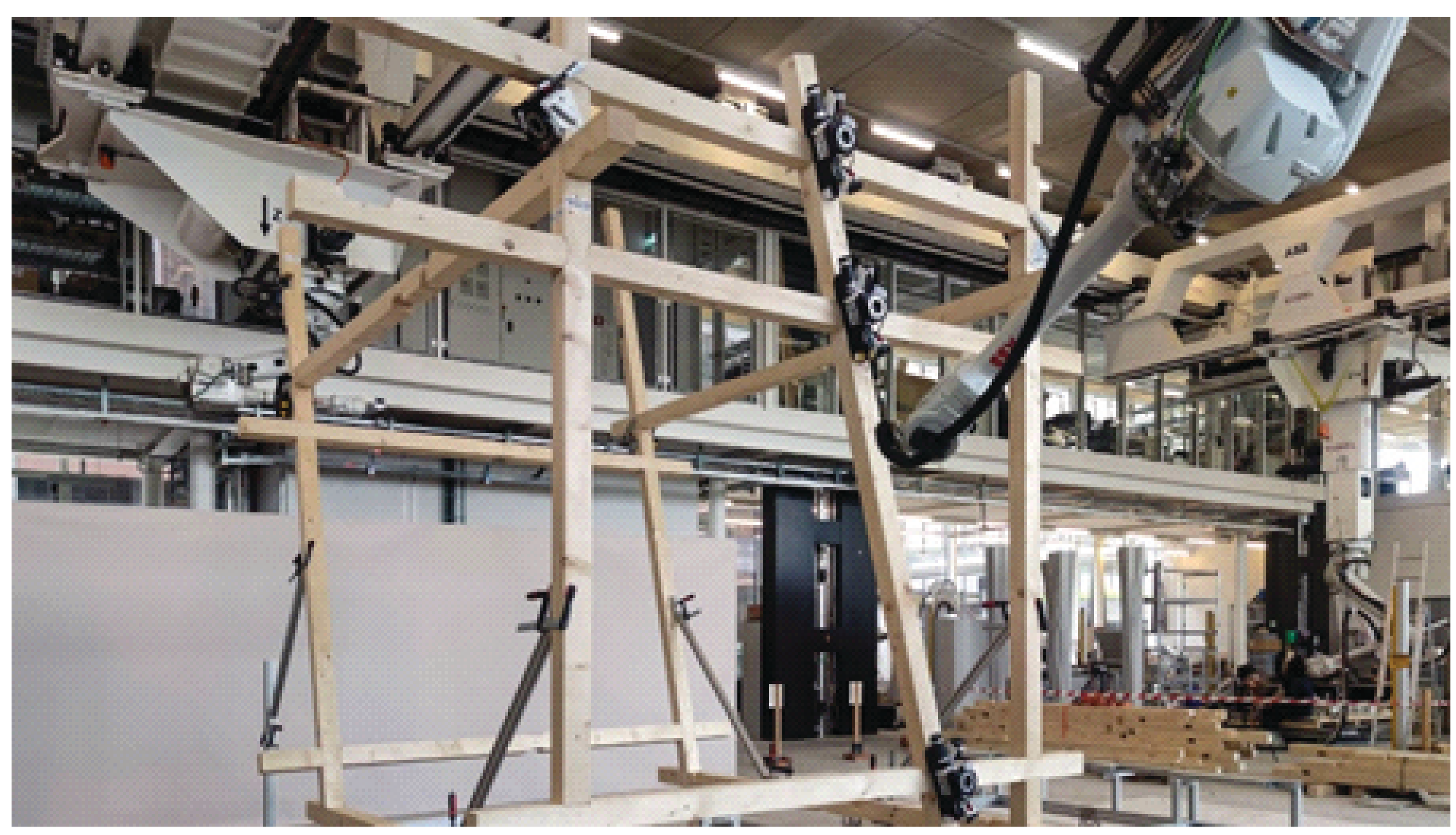


Previous approach

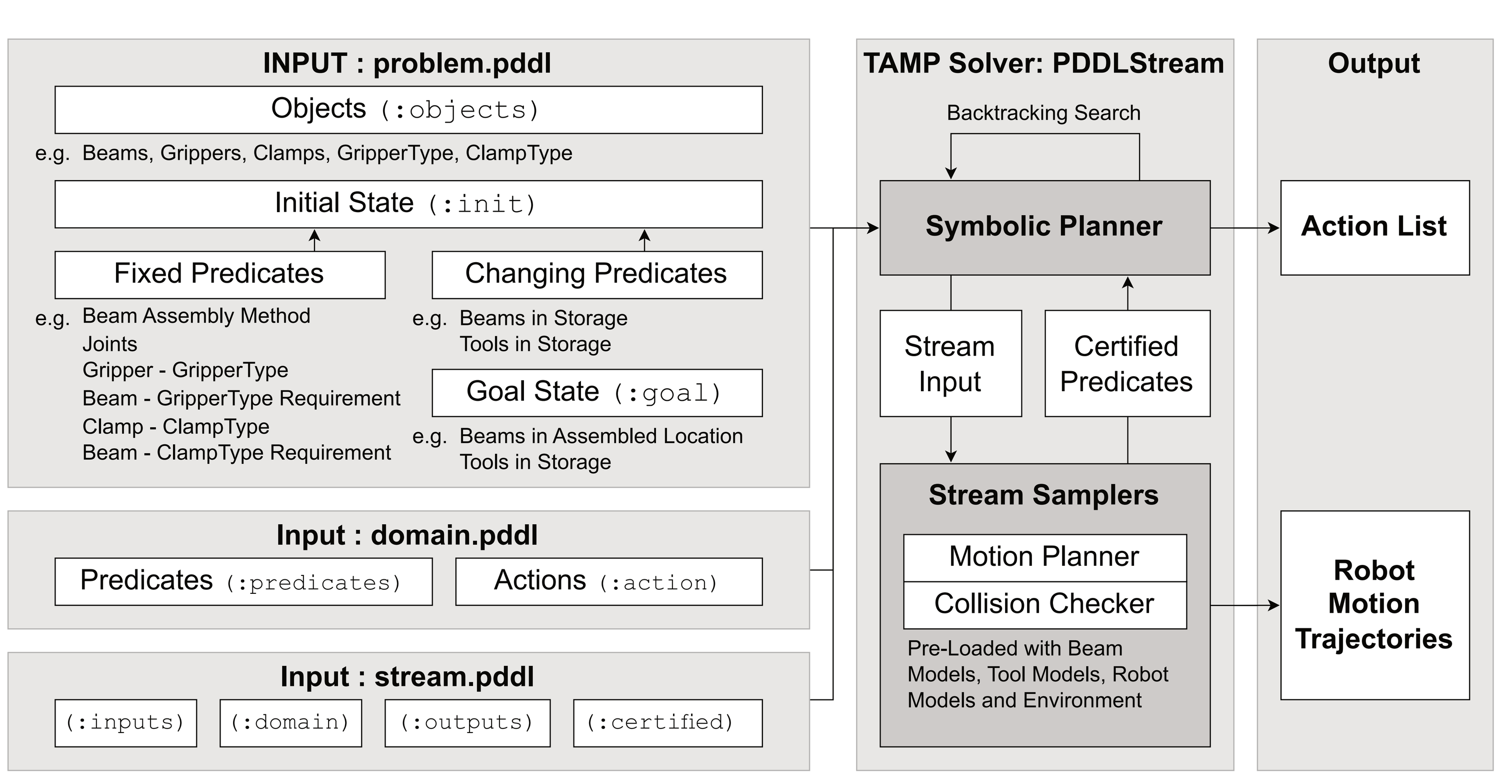




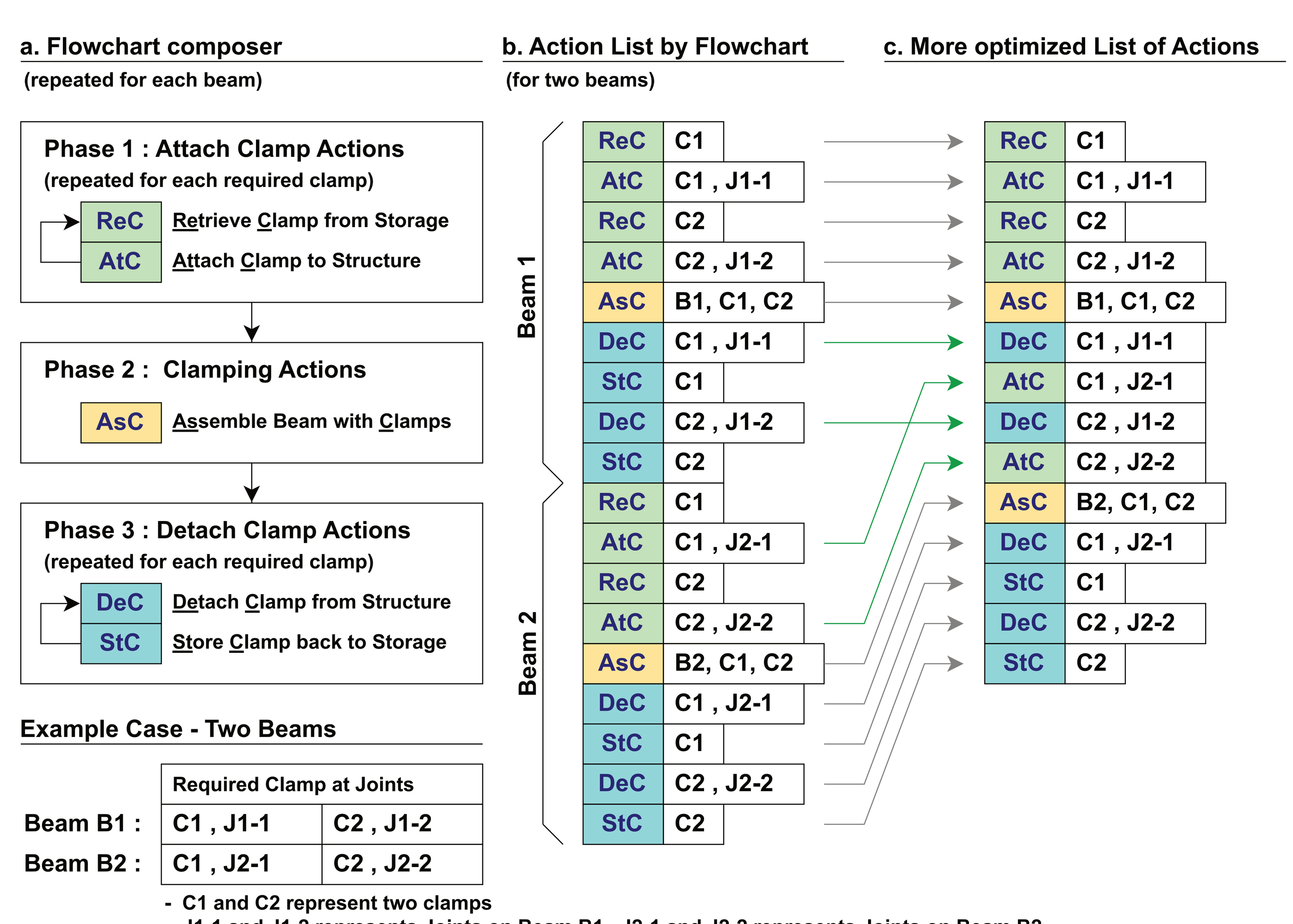
Case Study



Technical Approach



Results



	Planning methods	TAMP (This work)	Flowchart [1]
Execution Time for Actions (min)	Assemble Actions	558	558
	Gripper Actions	314	330
	Clamp Actions	574	839
	Total	**1446 (-16.3%)**	1727

Acknowledgments

Davide Tanadini
Giulia Boller
Aleksandra Anna Apolinarska
Lauren Vasey
Gonzalo Casas
Caitlin Mueller
Pierluigi D'Acunto
Philippe Fleischmann
Michael Lyrenmann

National Centre of Competence in Research Digital Fabrication

References

[*]This poster is adapted from: V.P.Y. Leung, Y. Huang, C. Garrett, F. Gramazio, M. Kohler. "Planning Non-repetitive Robotic Assembly Processes with Task and Motion Planning (TAMP)," to be presented at *Robotic Fabrication in Architecture, Art and Design (RobArch)*, Toronto, 2024

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