Research Roadmap: Computational Robotics

Andreas Orthey

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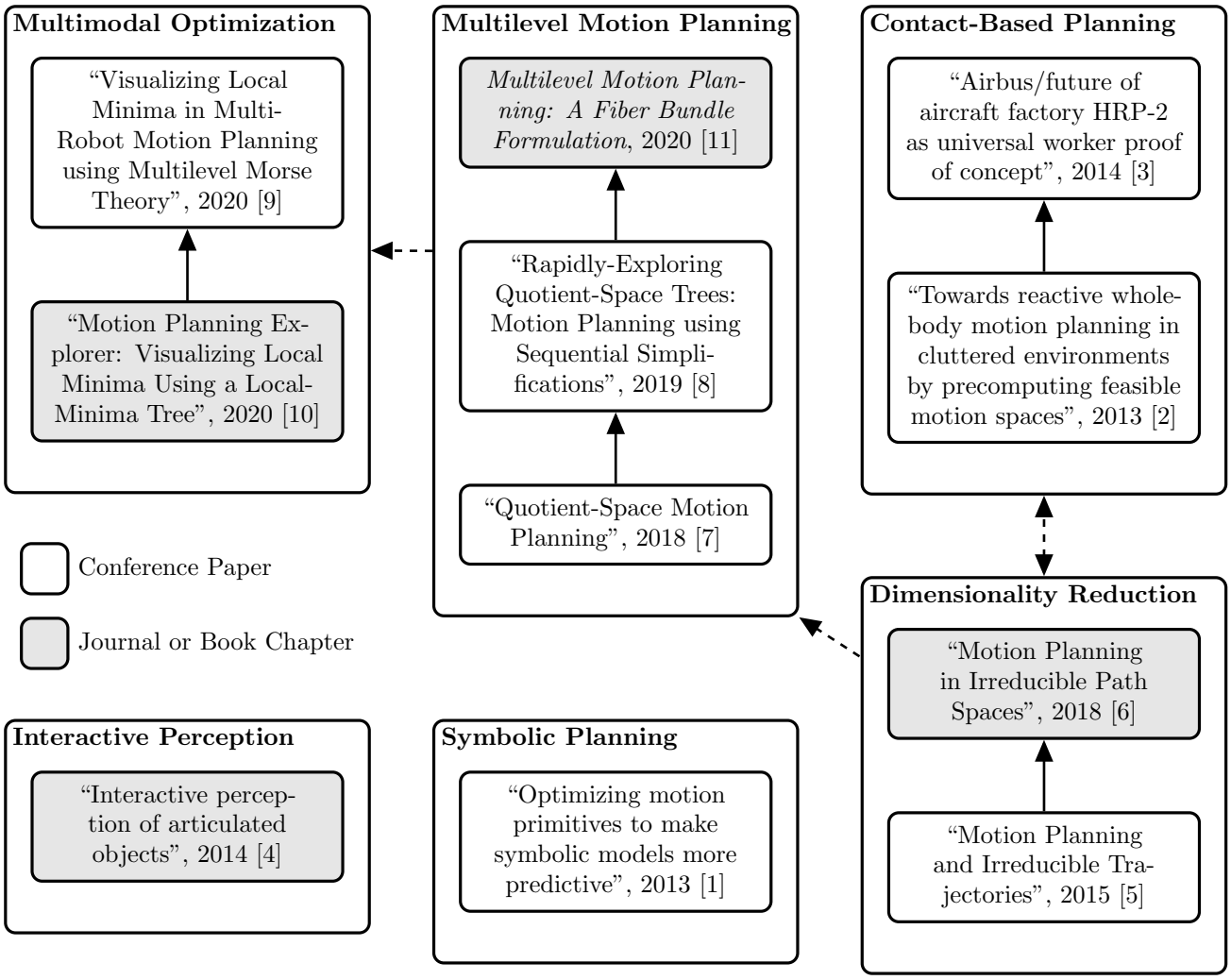
My research contributes to the field of computational robotics, in which we develop algorithms to efficiently control and plan motions for robotic systems. Such algorithms are essential for fields like computer animation, molecular biology, industrial automation, autonomous driving or space exploration.

To advance the state-of-the-art in computational robotics, I focus on three core topics. First, multilevel motion planning [7, 8, 11], in which we study multilevel abstractions of state spaces with the goal of finding good representations and to exploit those representations to simplify planning. Second, multimodal optimization [10, 9], in which we try to enumerate and visualize local modes (e.g. minima) of cost function landscapes, with the goal of finding contingencies for replanning, understanding the complexity of planning problems and finding sparse representations. Third, contact-based planning [2, 3], in which we try to solve high-dimensional planning problems for robots which move by making contacts with their environment. Contact-based planning problems also motivated my work on dimensionality reduction of state spaces [5, 6], which gave an impetus to more deeply study multilevel abstractions.

While controlling and planning motions is a crucial component, it is only one subfield of computational robotics. I also contributed to the fields of interactive perception [4] and symbolic reasoning [1].



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