

Ranged Kinematics and Time of Flight Sensors for Shared Autonomy Robotic Systems

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Shared autonomy mixes manual control and automation to make robots feasible in situations where fully automated (or fully manual) solutions are not. In this talk, I will describe our efforts to provide cost-effective solutions to two technical challenges that arise in building shared-autonomy robot manipulation systems: the need for responsive kinematics and the need for short-range (non-contact) sensing.

First, I will describe our work on Ranged Kinematics, where we exploit task tolerances to provide flexibility in robot motion generation. I will describe how we integrate tolerances into an inverse kinematics solver to provide an approach that is responsive in under both manual and automated control. Second, I will describe our work on using small, low-cost time-of-flight distance sensors to provide near-range information for robotics applications. I will describe how we can enhance the performance of commodity sensors by modeling their operation carefully and using their internally collected data. I will show how we can perform precise localization and small obstacle detection, using sensors that are typically only used for distance measurements.



Michael Gleicher is a Professor in the Department of Computer Sciences at the University of Wisconsin, Madison. Prof. Gleicher is founder of the Department's Visual Computing Group and co-directs both the Visual Computing Laboratory and the Collaborative Robotics Laboratory at UW-Madison. His research interests span the range of visual computing, including data visualization, robotics, and virtual/extended reality. His recent work includes exploring perceptual issues in visualization, the use of visual simulation for robotics, and geometric approaches to enhance robot perception and interaction. He has been Papers Chair for EuroVis and Area Chair for IEEE Vis. Prior to joining the University, Prof. Gleicher was a researcher at The Autodesk Vision Technology Center and in Apple Computer's Advanced Technology Group. He earned his Ph. D. in Computer Science (1994) from Carnegie Mellon University, and earned a B.S.E. in Electrical Engineering from Duke University (1988). In 2013-2014, he was a visiting researcher at INRIA Rhone-Alpes. Prof. Gleicher is an ACM Distinguished Scientist. In 2023-2024, Prof. Gleicher holds a concurrent appointment as a Design Scholar at Amazon Robotics.

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