NRI:FND: Efficient algorithms for safety guiding mobile robots through spaces populated by humans and mobile intelligent machines and robots

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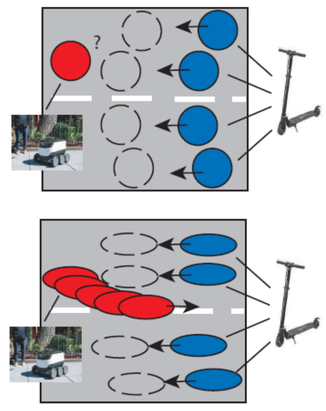
Project Objectives: Create reactive local motion planning algorithms for autonomous robots operating in dense environments populated by humans and other intelligent mobile machines. Our approach uses data-driven techniques to infer motion intents of mobile obstacles and compute collision-free paths while avoiding the so-called "freezing problem" in robotics



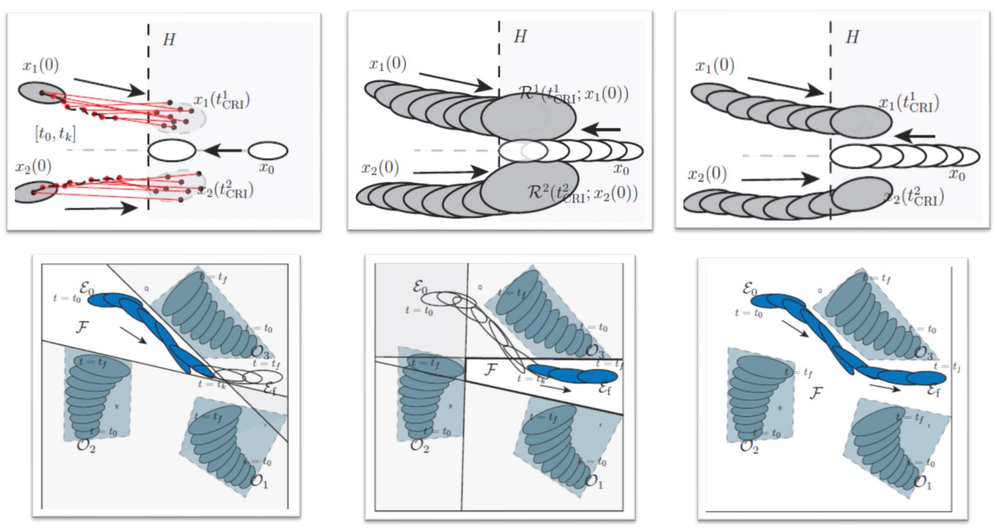
- Collision avoidance algorithms should account for the mobility characteristics and shape of mobile obstacles
- The motion intent of intelligent mobile obstacles may be hard to predict. Accounting for worst-case scenarios may lead to false negatives
- Sensing / perception uncertainty should be accounted explicitly without rendering the path planning problem intractable

Impact to research community in robotics:

- Contributions to robust path planning for uncertain robotic systems based on prediction of future trajectories of nearby interacting robotic systems and moving obstacles (e.g., manipulation problems in the outer space)
- Control of probability distributions can find applications in deployment problems for large-scale robotic networks

Proposed approach:

- Infer the probability density of the future states of mobile obstacles based on past motion data (instead of reachable sets)
- Robust, reactive local motion planning based on receding horizon convex optimization



Broader impact (society): Ensuring safety and harmonious co-existence of humans and robots is necessary for the smooth integration of robots and intelligent machines into our everyday lives and the workplace of the future.

Broader impact (education & outreach): Several undergraduate and under-represented students will participate in the experimental validation of this research using low-cost platforms in the facilities for robotic research in the PI's department

Broader impact (economy): The use of robots is expected to have a significant positive impact on national economy. This research promotes the safe operation of robots by preventing collisions that can cause damages and injuries, economic losses or even loss of life