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Multi Object Tracking for Predictive Collision Avoidance

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Abstract : The safe and efficient operation of Autonomous Mobile Robots (AMRs) in complex environments, such as manufacturing, logistics, and agriculture, necessitates accurate multiobject tracking and predictive collision avoidance. This paper presents algorithms and techniques for addressing these challenges using Lidar sensor data, emphasizing ensemble Kalman filter. The developed predictive collision avoidance algorithm employs the data provided by lidar sensors to track multiple objects and predict their velocities and future positions, enabling the AMR to navigate safely and effectively. A modification to the dynamic windowing approach is introduced to enhance the performance of the collision avoidance system. The overall system architecture encompasses object detection, multi-object tracking, and predictive collision avoidance control. The experimental results, obtained from both simulation and real-world data, demonstrate the effectiveness of the proposed methods in various scenarios, which lays the foundation for future research on global planners, other controllers, and the integration of additional sensors. This thesis contributes to the ongoing development of safe and efficient autonomous systems in complex and dynamic environments.

Keywords : autonomous mobile robots, multi-object tracking, predictive collision avoidance, ensemble Kalman filter, lidar sensors
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