Contribution to collaborative robotics for ultrasound imaging (echography/sonography)

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Résumé

Here we present the integration of an Artificial Potential Field (APF) obstacle avoidance motion planner into a teleoperation control system for tele-echography during CT-PET imaging procedures. This approach prioritizes the safety of both the patient and the robot. The system utilizes a UR3e collaborative robot to manipulate an ultrasound probe, controlled by a radiologist using a Phantom Omni haptic device. The bilateral teleoperation framework ensures the probe position control. To overcome challenges posed by obstacles within the workspace, an APF-based obstacle avoidance mechanism is employed, allowing safe navigation in constrained environments such as PET-CT device gantries. Haptic feedback generated by the APF algorithm enhances the radiologist's awareness of obstacles, supporting real-time decision-making and adaptive actions. This integration significantly enhances the safety and efficiency of tele-echography procedures.

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