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Optimized Assistive Human-robot Interaction (HRI) Using Reinforcement Learning

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               Yeung Kin Man Acad Building

Abstract

Co-robotics involves humans and robots working together safely in the same shared space as a team. This motivates physical Human-Robot Interaction (HRI) systems that adapt to different humans and have guaranteed robustness and stability properties. For modern interactive HRI systems to be capable of performing a wide range of tasks successfully, it is required to include the effects of both the robot dynamics and the human operator dynamics. In this talk we propose three adaptive HRI control systems that assist the human operator to perform a given task with minimum human workload demands and improved overall human-robot system performance.

Human performance neuropsychological and human factors studies have shown that in coordinated motion with a robot, human learning has two components. The operator learns a robot-specific inverse dynamics model to compensate for the nonlinearities of the robot, and simultaneously learns a feedback control component that is specific to the successful performance of the task. These foundations can be incorporated in the design of HRI control systems that include the effects of both the robot dynamics and the human dynamics by using a 2-loop design procedure.

Biography

Lewis is ranked the top #1 highly ranked scholar in the world in the two fields of Optimal Control and Reinforcement Learning, and #2 scientist in Control Theory by ScholarGPS. https://scholargps.com/scholars/49731442444026/frank-l-lewis. He is a Fellow of National Academy of Inventors. Fellow IEEE, Fellow IFAC, Fellow AAAS, Fellow U.K. Institute of Measurement & Control, PE Texas, U.K. Chartered Engineer. UTA Distinguished Scholar Professor, UTA Distinguished Teaching Professor, and Moncrief-O'Donnell Chair at The University of Texas at Arlington Research Institute. Founding Member Mediterranean Control Association. Lewis has supervised 60 PhD students. Ranked as number 24 in the world of all scientists in Electronics and Electrical Engineering by https://Research.com. Bachelor's Degree in Physics/EE and MSEE at Rice University, MS in Aeronautical Engineering at Univ. W. Florida, Ph.D. at Ga. Tech. He works in feedback control, reinforcement learning, intelligent systems, and distributed control systems.

All are welcome