

Robotics and Autonomous Systems Thesis Defense

Game-theoretic Empathetic Parameter Estimation in Two-Vehicle Interaction

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Abstract

Recent years, there has been many attempts with different approaches to the human-robot interaction (HRI) problems. In this paper, the multi-agent interaction is formulated as a differential game with incomplete information. To tackle this problem, the parameter estimation method is utilized to obtain the approximated solution in a real time basis. Previous studies in the parameter estimation made the assumption that the human parameters are known by the robot; but such may not be the case and there exists uncertainty in the modeling of the human rewards as well as human's modeling of the robot's rewards. The proposed method, empathetic estimation, is tested and compared with the "non-empathetic" estimation from the existing works. The case studies are conducted in an uncontrolled intersection with two agents attempting to pass efficiently. Results have shown that in the case of both agents having inconsistent belief of the other agent's parameters, the empathetic agent performs better at estimating the parameters and has higher reward values, which indicates the scenarios when empathy is essential: when agent's initial belief is mismatched from the true parameters/intent of the agents.



April 2, 2021; 3 PM;

Zoom Link: <https://asu.zoom.us/j/9962342018>