

Title

Reinforcement Learning for Ball Balancing Using a Robot Manipulator

Presenter

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Abstract

In this tutorial, we will demonstrate how to use reinforcement learning to solve control tasks in complex dynamic systems such as a redundant robot manipulator. The goal of the task is to design a controller that can balance a ping-pong ball on a flat surface attached to the end effector of the manipulator. Model-based control theories like Model Predictive Control (MPC) or other methods can solve such tasks by creating mathematical models of the plant, but it may become difficult to design such controllers when the plant model becomes complex. Model-free reinforcement learning is an alternative in such situations. We will go through how to use the Reinforcement Learning Toolbox™ to create and train agents that can perform the ball balancing task while being robust to variabilities in the environment. At the end of the tutorial, you will have learned how to create environments, represent agents through neural networks, and train the networks to satisfactory performance.

Bio

Ari Biswas is a Software Engineer at MathWorks. He has a background in system dynamics and controls and develops software tools for the Reinforcement Learning Toolbox. Ari holds an M.S. degree in Aerospace Engineering from Texas A&M University (2017). His interests are in model-based design, robotics, and artificial intelligence.