# Reinforcement Learning For Autonomous Quadrotor Helicopter

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### Reinforcement Learning For Autonomous Quadrotor

**Autonomous Quadrotor Control with Reinforcement Learning**
Autonomous Quadrotor Control with Reinforcement Learning Michael C Koval mkoval@csrutgersedu Christopher R Mansley cmansley@csrutgersedu Michael L Littman mlittman@csrutgersedu Abstract Based on the same principles as a single-rotor helicopter, a quadrotor is a flying vehicle that is propelled by four horizontal blades surrounding a

**Reinforcement Learning for Autonomous Quadrotor ...**
Reinforcement Learning for Autonomous Quadrotor Helicopter Control Michael Koval, Christopher Mansley, and Michael Littman Rutgers, the State University of New Jersey Abstract I Quadrotor helicopters are rapidly nding use for a number of applications I Programming a new behavior means implementing a control algorithm

**Deep Flight: Autonomous Quadrotor Navigation with Deep ...**
Deep Flight: Autonomous Quadrotor Navigation with Deep Reinforcement Learning Ratnesh Madaan*, Dhruv Mauria Saxena*, Rogerio Bonatti, Shohin Mukherjee, Sebastian Scherer The Robotics Institute Carnegie Mellon University, Pittsburgh, PA 15213 Email: {ratneshm, dsaxena, rbonatti, shohinm, basti}@andrewcmuedu *Equal contribution

**Reinforcement Learning for Autonomous UAVs**
• Increase autonomy of quadrotor by use of onboard camera for reward and/or state recognition • Build a Delfly for research use Publications

(Submitted) Junell, J, van Kampen, E, de Visser, C, and Chu, Q “Reinforcement Learning Applied to a Quadrotor Guidance Law in Autonomous Flight”, AIAA

**Reinforcement learning and model predictive control for ...**

A new method for enabling a quadrotor micro air vehicle (MAV) to navigate unknown environments using reinforcement learning (RL) and model predictive control (MPC) is developed An efficient implementation of MPC provides vehicle control and obstacle avoidance RL is used to guide the MAV through complex environments where dead-end corridors may

**IEEE ROBOTICS AND AUTOMATION LETTERS. PREPRINT ...**

IEEE ROBOTICS AND AUTOMATION LETTERS PREPRINT VERSION JUNE, 2017 1 Control of a Quadrotor with Reinforcement Learning Jemin Hwangbo1, Inkyu Sa2, Roland Siegwart2 and Marco Hutter1 Abstract—In this paper, we present a method to control a

**Toward End-to-End Control for UAV Autonomous Landing via ...**

Toward End-to-End Control for UAV Autonomous Landing via Deep Reinforcement Learning Riccardo Polvara1, Massimiliano Patacchiola2 Sanjay Sharma 1, Jian Wan , Andrew Manning 1, Robert Sutton and Angelo Cangelosi2 Abstract—The autonomous landing of an unmanned aerial

**Autonomous vehicle control via deep reinforcement learning**

Autonomous vehicle control via deep reinforcement learning to Reinforcement Learning (RL) models, yielding deep Reinforcement Learning Unlike general DL-methods where the model is trained on a labeled dataset, rein- RL-algorithm called Q-learning to a quadrotor Remarkably they only used syn-

**Shared Autonomy via Deep Reinforcement Learning**

Shared Autonomy via Deep Reinforcement Learning Siddharth Reddy, Anca D Dragan, Sergey Levine Dept of Electrical Engineering and Computer Science University of California, Berkeley fsgr,anca,svlevineg@berkeleyedu Abstract—In shared autonomy, user input is combined with semi-autonomous control to achieve a common goal The goal

**Towards Table Tennis with a Quadrotor Autonomous Learning ...**

Towards Table Tennis with a Quadrotor Autonomous Learning Robot and Onboard Vision* Rui Silva 1and Francisco S Melo and Manuela Veloso 2 Abstract Robot table tennis is a challenging domain in both robotics, articial intelligence and machine learning In terms of robotics, it requires fast and reliable perception and control; in

**Learning Deep Control Policies for Autonomous Aerial ...**

Learning Deep Control Policies for Autonomous Aerial Vehicles with MPC-Guided Policy Search Tianhao Zhang, Gregory Kahn, Sergey Levine, Pieter Abbeel Abstract—Model predictive control (MPC) is an effec-tive method for controlling robotic systems, particularly au-tonomous aerial vehicles such as quadcopters However, ap-

**Using Machine Learning to Learn from Demonstration ...**

Using Machine Learning to Learn from Demonstration: Application to the ARDrone Quadrotor Control Kuan-Hsiang Fu December 15, 2015 quadrotor was created using a reinforcement learning algorithm and function approximators with some In reinforcement learning, a reward function is used so that the agent can learn the behavior

**Learning Unmanned Aerial Vehicle Control for Autonomous ...**

Learning Unmanned Aerial Vehicle Control for Autonomous Target Following Siyi Li1, Tianbo Liu2, Chi Zhang1, Dit-Yan Yeung1, Shaojie Shen2 1

Department of Computer Science and Engineering, HKUST 2 Department of Electronic and Computer Engineering, HKUST fsliay, czhangbr, dyyeungg@cseusthk,ftliuam, eeshaojieg@usthk

**Low Level Control of a Quadrotor with Deep Model-Based ...**

Low Level Control of a Quadrotor with Deep Model-Based Reinforcement Learning Nathan O Lambert 1, Daniel S Drew , Joseph Yaconelli2, Roberto Calandra , Sergey Levine 1, and Kristofer S J Pister Abstract—Generating low-level robot controllers often re-

**Intelligent Flight Control of an Autonomous Quadrotor**

12 Intelligent Flight Control of an Autonomous Quadrotor Syed Ali Raza and Wail Gueaieb University of Ottawa, Canada 1 Introduction This chapter describes the differ ent steps of designing, buildi ng, simulating, and testing an intelligent flight control module for an increasingly popular unmanned aerial vehicle (UAV), known as a quadrotor

**Multi-Agent Quadrotor Testbed Control Design: Integral ...**

Reinforcement Learning control are presented as two design techniques for accommodating the nonlinear disturbances The methods both result in greatly improved performance over classical control techniques I INTRODUCTION As first introduced by the authors in [1], the Stanford Testbed of Autonomous Rotorcraft for Multi-Agent Con-

**A General Safety Framework for Learning-Based Control in ...**

A General Safety Framework for Learning-Based Control in Uncertain Robotic Systems Jaime F Fisac 1, Anayo K Akametalu , Melanie N Zeilinger2, Shahab Kaynama3, Jeremy Gillula4, and Claire J Tomlin1 Abstract—The proven efficacy of learning-based control

**Vision-Based Navigation and Deep-Learning Explanation for ...**

ever, deep learning models are often thought of as ‘black boxes’ in reference to the difficulties of tracing a prediction back to important features to understand how an output was arrived at When the robots operate in human environments, their lack of interpretability is a major problem for

**Delft University of Technology Self-tuning gains of a ...**

Self-tuning Gains of a Quadrotor using a Simple Model for Policy Gradient Reinforcement Learning Jaime Junell , Tommaso Mannucci, Ye Zhou, and Erik-Jan van Kampeny Delft University of Technology Delft, The Netherlands February 28, 2017 Abstract Autonomous ight of Micro Aerial Vehicles (MAVs) faces many challenges in the realm of control