

CSCI 596 Course project

A parallel, multi agent reinforcement learning framework

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1 Introduction

Reinforcement learning has been widely used in robotics and control [? ? ? ? ?]. In recent years, it has also been introduced to solving fluid problems, such as flow control [? ? ? ? ?], soaring of birds [? ?] and energy-efficient station keeping of balloon [?]. Recently, there are also several fascinating and important studies applied reinforcement learning technic in the field of fish swimming. In a potential flow, [?] used reinforcement learning to train a three-link fish to swim in a given direction efficiently. Using a Navier-Stokes solver combined with reinforcement learning algorithm, Koumoutsakos *et al.* have discovered the efficient strategy for fish's schooling behavior [? ?] and C-start [?]. [?] found that using reinforcement learning, a low velocity swimmer can fulfill efficient point-to-point navigation in a Kármán vortex street.

2 Algorithm

3 Code structure

4 Validation cases

5 Comparison

Using Proximal Policy Optimization (PPO) algorithm, on a same problem, train networks with four configurations, and compare their performance:

Activation function: tanh, sin

A separate actor and critic and combining actor and critic in a same neural network.