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描述已自动生成MSC Project Outline

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Chosen topics

Multi-agent Path Planning based on Distributed Active Exploratory Reinforcement Learning Algorithm

Introduction

Multi-agent path planning is a key technology to study the coordinated actions of multiple agents in a shared environment to achieve their respective goals. With the development of artificial intelligence and automation technology, multi-agent systems have been widely used in areas such as drone formation, warehouse robot scheduling, traffic management and computer games. The goal of multi-agent path planning is to ensure that all agents can reach their respective destinations efficiently and conflict-free, while maximizing the overall system performance. Multi-agent path planning is a research field full of challenges and opportunities, and its technological development is of great significance in promoting the application of intelligent systems and improving the efficiency of multi-agent working together.

Motivations

Traditional path planning algorithms suffer from dimensionality limitations when encountering large-scale multi-agent path planning, so we would like to solve this problem using deep reinforcement learning.

In the multi-agent path planning problem, how to make the agents work together is an important issue. Although most of the current decentralized MAPF algorithms achieve good results in experiments, the system does not communicate between the intelligences and does not take full advantage of the scalability of distributed control. Therefore, this project plans to develop a distributed reinforcement learning algorithm using graph neural networks in conjunction with reinforcement learning, which enables communication collaboration between agents.

Possible methodologies

First, In this project, we plan to choose A2C algorithm, in A2C algorithm, we use CNN for map information extraction, the extracted information is input into graph neural network, the output of graph neural network is the aggregated map feature information, then each intelligent body gets this aggregated information and get the optimal path by training.

图示

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Figure 1: A2C with GNN

Expected outcomes

The project is planned to be developed in python and the model is built using pytorch. The result that achieved by optimized algorithm will be compared with that of the original algorithm to discuss the performance and the expected results can prove the effectiveness of the optimized algorithm.