

Reinforcement Learning Based Generative Art Agent

Project Proposal

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This document describes the system proposed to train for the final project. At a high level, we are experimenting teaching an artificial intelligent agent how to draw on a canvas using reinforcement learning.

Problem statement

Drawing and creative art are a critical part of human civilisation and culture. To learn how to draw would take years of learning and practising for humans. Hence we want to explore the idea of training an artificial intelligence agent that can paint strokes on a canvas in sequence to generate a new painting.

The experiment contains two parts. First part is training the agent. We will start by defining a 2D environment (canvas) for agents to simulate the painting, and each training canvas will be initialised with a set of negative rewarding grid, positive rewarding grid and hazard zones. The initial parameters for the rewarding would be based on abstract art paintings. We will be pre-processing those images to extract only the edges and shapes of the painting. Then the canvas grid point will be defined accordingly. The next step is to allow the agent to explore the environment while avoiding danger zones, maximize coverage given a set amount of energy, and maximize surface area covered if the agent had a "sprayer" attached.

The second part is optional, we will take the output from the phase 1 (final policy or snapshots of the agents movement throughout the training) then render it into an image. At this stage we would play around with different art effects adding color schemes, brush effects, position scaling. There wouldn't be a strictly defined success criteria in the second phase, artwork will be reviewed by aesthetic appreciation.

Datasets to use

The datasets used for the project are: OpenAI Box2D environment, OpenAI gym-minigrid, Kaggle Abstract Art Datasets, etc.

Input and output behaviors of the system

The inputs to the system will be curated abstract artworks, reward functions, and transition dynamics policies. Outputs would be trained behaviours (guided by the optimal policies) and artworks.

Challenges faced in building the system

We foresee a few challenges in the process of building the system. First, how we can define a meaningful 2D environment (not just randomly initialize the grid with positive, negative and danger zones). Second, define how many actions an agent can take, for example stroke

location, transition angle, pressure, transparency, colors, total energy, etc. Lastly, it is difficult to quantify a “good art” and how to measure an agent's ability to achieve it.

Reference

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