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Extra Credit Report

The goal of the research is to explore the different ways of applying Machine Learning in the domain of game level and environment design. The problem that the research is trying to solve is that currently, game level design requires hand-authoring. In addition, any procedural content generation can take roughly as long due to the difficulty of developing and maintaining generation algorithms. Machine Learning may be a solution to the problem, but typical methods tend to produce an output that is like the average of the inputs, which may not be ideal in some cases. The purpose of the research is to see whether the combined efforts of a human designer plus a machine learning algorithm could subvert these problems. If so, then this new framework of developing can be used commercially to actually develop novel levels, or for research, by automatically generating new environments to train in.

The purpose of this experiment in particular to determine the initial lessons on applying currently known ML/AI approaches to the problem before developing a novel approach. This will provide a sort of baseline to which future approaches can be evaluated. The experiment attempts to gain this knowledge by having participants interact with black-box models and judging them comparatively on some number of features that may or may not be included in the final agent.

There were two AI systems that I interacted with during the study. The first one is called Snodgrass and Ontanon, which is a Markov Chain based level. Instead of being represented as pixels, the levels represented as higher-order tile types. The algorithm parsed these tiles to extract all the individual tiles: the tile to the left, below, and to the left-below the tile. It created a large dictionary for each L-shape of tiles and predicts the tile that should be used to complete the 2-by-2 square. The algorithm starts at the lower left corner and processes the level going up and to the right.

The second agent was called Summerville and Mateas, which is a Long Short Term Recurrent Neural Network, and used a deep learning model. The training set of levels were parsed into higher-order tile types into a 2D matrix, and sequences were derived by snaking up and down along the columns of the matrix. These sequences were then fed into a seq2seq LSTM model to output the next most likely tile. This algorithm then iterated to produce new levels.