Artificial Intelligence - Research Journal

Machine Learning

A new way of looking at Procedurally Generated Content (PCG) is to now train generators on existing content, so that the generator can make content of the same look or type. This was brought about by advancements in deep neural networks.

Generative Adversarial Nets – This is where a generative model is generated by simultaneously training two models: one is a generative model that records the data distribution and a discriminative model which that estimates the whether a sample has come from training data or whether it has been made by the generative model.

Generative Adversarial Nets and Variational Auto Encoders have made good progress in learning to create image of items such as bedrooms, cats or faces. Although these kinds of generative methods that are based off of machine learning can make decent renditions of some content such as music and images, some games content is a little more complicated. The main difference between generating content for a game and generating content for other domains, is that quite a lot of game content has specific structural constraints that must be fulfilled. For example a level must have a structure that allows the level to be completed.

The same programs that make almost correct images of bedrooms and animals, can’t be used as they still have structural discrepancies such as impossible angles or extra legs are less suitable for generating a map that needs to have an exit. This is why machine learning has not had much success in PCG for games. One other reason is that there is not much game content that the computer can train off of. This is however being researched and a lot of progress can be achieved in the next few years.

The main difference between PCG using machine learning and PCG that is search based **(RESEARCH**), is that the content is generated directly such as via sampling, from models that have been trained on game content. There are some search based PCG that have had their evaluation functions trained on game content such as Shaker et al (**RESEARCH**) or Liapis et al(**RESEARCH**) the actual content is actually generated based off search.