Sprite Generation

CS 534 - Fall 2018 - Term Project
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Problem

• Content generation for video games is time consuming
• Current approaches
  ○ Hand-craft everything
  ○ Develop composite sprites from discrete pieces (head, hair, shirt, etc.) [1]
  ○ Turn to machine learning [2]

• Is this computational photography?
  ○ No, but approach should be a generalizable principle.
Solution

- Inspired by Horsley & Perez-Liebana’s 2017 paper
  - *Building an Automatic Sprite Generator with Deep Convolutional Generative Adversarial Networks*
- Learn visual metaphors used in pixel art [3]
  - Pretrain an autoencoder to learn the art style, then flip encoder and decoder
  - 32 x 32 x 4 images
- Use a DCGAN to learn the feature autoencoder feature space
- Technologies
  - Keras
  - Google Colab
DCGAN + Autoencoder

Step 1: Pretrain

Pretrain Dataset → Encoder → Decoder → Reconstructed Dataset

Step 2: Train GAN

Input Random Vector → Generator → Decoder → Encoder → Discriminator → Real / Fake

Training Dataset
Results: Environment

Autoencoder

- Autoencoder could not learn environment sprites
- Comparison with ample time can learn some reasonable looking sprites

Comparison
Results: Items

Autoencoder

- Comparison network does not do well until it starts duplicating from dataset
- Comparison has difficulty learning new coloring
- Autoencoder learns new coloring and novel structuring
- Autoencoder has difficulty with quality structuring of sprite
- Both have random pixel noise outside of the structure
Challenges and Limitations

- Mode collapse, learning only few exemplars
- Dataset high variance without enough sprites in each category
- Autoencoder not learning color with small datasets
- Multi-layer autoencoder not learning dataset variance
- Time to train (Google Collab helped)
- GAN not learning correct color
- Discriminator goes to zero quickly
Takeaway

- Autoencoder augmented GAN learns faster but has stability problems
- Autoencoder can learn feature space, GAN need only learn this new space
  - Seems to result in novel combinations
- Using only the decoder boosts generators performance early.
  - Still not stable but an improvement
- Develop GAN for grayscale sprites with a separate recoloring network?
References


Dataset Sources

1. Henrique Laxarini (7Soul1). 496 Pixel Art Icons for Medieval/Fantasy RPG. License: CC0 - Public Domain. Online: https://opengameart.org/content/496-pixel-art-icons-for-medievalfantasy-rpg
4. Lanea Zimmerman (Sharm). Tiny 16: Basic. License: CC-BY 3.0. Online: https://opengameart.org/content/tiny-16-basic