a new workflow for anime character creation

Yanghua Jin
Preferred Networks
Otaku Market Size

Anime Industry Market 2153

Revenues in billions, 2017

Anime Studios 244

Otaku Market 733

Anime related markets

Amateur creator markets
What stop us from creating?

Hard work

Appropriate tools
GAN for anime character creation

- DRAGAN with an auxiliary classifier
- Controlling by conditions

MakeGirlsMoe, Jin et al., 2017
GAN for anime character creation

- **StyleGAN**
- Decompose the stylegan architecture into 3 levels:
  - Color: High level style
  - Details: Middle level style
  - Pose: Low level style
- User can explore the model with different latent styles
Create *characters* with *precise control*
Image Manipulation

- Existing works encoded images into feature vectors
- And use feature manipulation to control image appearance

Pros
- Easier to manipulate in feature space

Cons
- Lacks of precise control
Texture Feature Manipulation

- Images as composition of shapes and their textures
- Disentangled shapes & textures
- Enables us to control shapes and textures individually
Training Pipeline

Encoder → Feature Map → Shape Pooling → Spatial Normalization → Decoder

Facial Parts Segmentation → Shape Map

Concurrent work on CVPR 20
SEAN: Image Synthesis with Semantic Region-Adaptive Normalization
**Shape Pooling Module**

- Expanded texture features (C x H x W)
- Texture feature x N (C x 1 x 1)

N: Number of semantic regions
C: Number of feature channels

Avg pooled by each semantic region

Shape (N x H x W)

Expand by shape

Feature (C x H x W)
Spatial Normalization Module

Expanded texture features

Decoded feature maps

Segmap

Conv

Conv

Conv

AdaIN

Params

SpatialAdaIN

SpatialAdaIN

AdaIN

Params

Conv
Testing Pipeline

Feature Map

Texture Feature

Texture Feature

Texture Feature Mixing

Decoder

Feature Map
Animate anime characters
Animate it!

- Fancy NN based approach
  - Failed to do precise control
  - Hard to compute on edge devices
  - Difficult to integrate into existing games

- 2D Mesh Morphing based approach
  - Explainable
  - Easy to run on edge devices
  - Widely industrial use
Some existing apps:

- Mug life
Animate it!

No Layers !!!
GAN Generated real people and anime characters
## Industrial solution for character animation

<table>
<thead>
<tr>
<th></th>
<th>Live2D</th>
<th>E-Mote</th>
<th>Spine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mesh Type</strong></td>
<td>Unstructured Grid</td>
<td>Structured Grid</td>
<td>Unstructured Grid</td>
</tr>
<tr>
<td><strong>Complexity</strong></td>
<td>High</td>
<td>Low</td>
<td>Middle</td>
</tr>
<tr>
<td><strong>Bone</strong></td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Templates</strong></td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Open-sourced SDK</strong></td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Extendability</strong></td>
<td>Middle</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td><strong>Common use cases</strong></td>
<td>Anime character animation</td>
<td>Anime character expression</td>
<td>Action clips/SD character animation</td>
</tr>
</tbody>
</table>
- Eyebrow
- Eyelash
- Eyelash closed
- Iris
- White of the eye
- Nose
- Mouth
- Mouth closed
- Face outline
- Body
- Front Hair
- Back Hair
E-Mote Demo
Overview

- Eyebrow
- Eyelash
- Iris
- White of the eye
- Nose
- Mouth

GAN Generated

- Face outline
- Body
- Front Hair
- Back Hair
Fine-grained Facial Parts Segmentation

- Eyebrow
- Eyelash
- Iris
- White of the eye
- Nose
- Mouth
Amodal Segmentation & Completion

- Face Outline
- Body
- Front Hair
- Back Hair
Plug and Play

E-Mote Default Templates
Conclusion
Workflow

Estimate → Generate

Generate ← Estimate

[Three images of different cartoon characters, showing a workflow process]
Q&A