Computer Graphics and Deep Learning: AI-assisted Character Animation

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Team 4

Project-Based Learning

Introduction

The purpose of this project is in order to explore using generative AI models (ChatGPT, Midjourney) to automatically create character animations and how modern AI tools can meet with traditional animation pipelines to create mixed-reality animation experiences.

This project first uses DALLE to generate the character image, and by combining the Animated Drawings Pipeline to process the original image, bind the character skeleton and finally realize the function of 2D image to simulate the human movement.

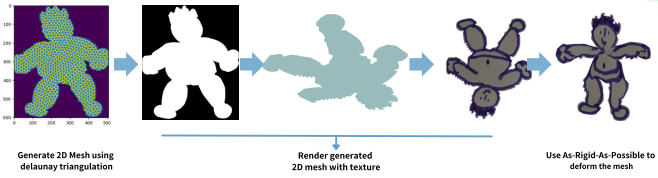


Figure 1. How to generate a complete 2D character object.

Method

Step1.Retrieve predicted segmentation mask and estimated joints from pretrained network

Step2.Combining skeleton, mesh and texture images

- **Generate 2D Mesh using delaunay triangulation**
- **Render generated 2D mesh with texture**
- **Use As-Rigid-As-Possible to deform the mesh**
- **Use the characterMotion object to get the updated joint position for different frames during the animation**

Step3. Use ffmpeg to put together a sequence of images into a video

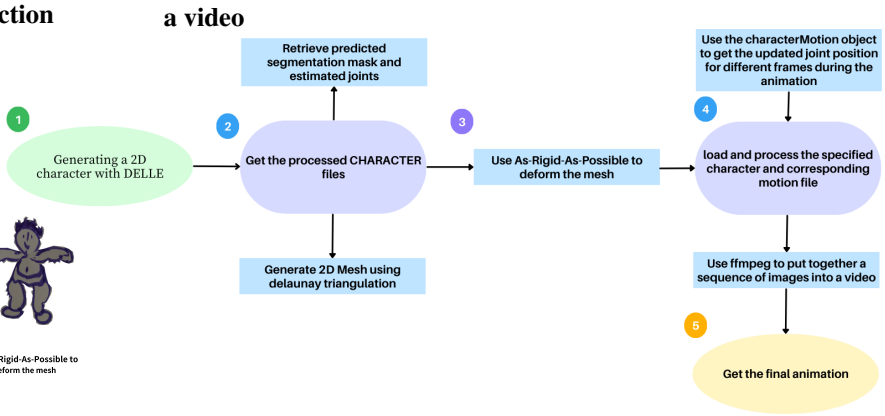
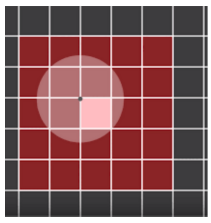


Figure 2.Image Processing Flowchart

Main Applied Techniques

- **Poisson Disk Sampling**
- **As-Rigid-As-Possible(ARAP)**
- **characterMotion**
- **ffmpeg**



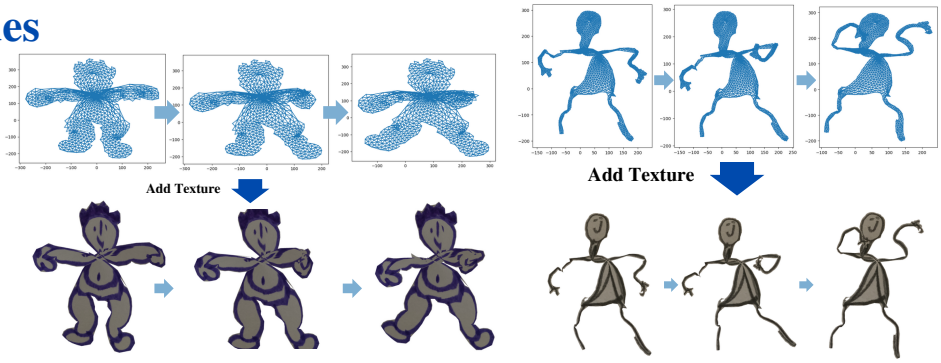


Figure 3. Adding a texture layer to a 2D character bound to a skeleton

Improvements

1. **Some deformation occurs in the texture overlay of the generated character objects, which can be improved to enhance the display effect for better presentation.**
2. **By utilizing the camera and real-time motion and skeleton recognition of the human body, we can apply these movements to 2D characters, enabling them to perform the same actions as humans in real-time. This enhancement will further enhance the practical application of this project.**

References

[1] Smith, Harrison Jesse, et al. "A Method for Automatically Animating Children's Drawings of the Human Figure." arXiv preprint arXiv:2303.12741 (2023).
[2] Turja, Simanta Deb, et al. "Shapes2Toon: Generating Cartoon Characters from Simple Geometric Shapes." 2022 IEEE/ACS 19th International Conference on Computer Systems and Applications (AICCSA). IEEE, 2022.
[3] Huang, Qixing, et al. "Arapreg: An as-rigid-as possible regularization loss for learning deformable shape generators." Proceedings of the IEEE/CVF international conference on computer vision. 2021.
[4] https://igl.ethz.ch/projects/ARAP/