Design for Hypnotic Line Art Animation from a Still Image

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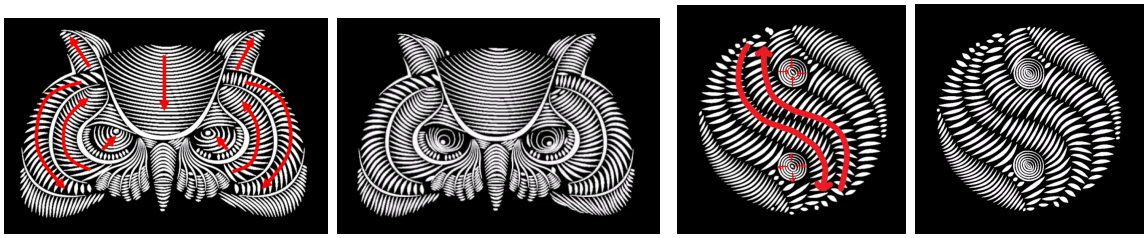

(a) (b) (c) (d)

Figure 1: Hypnotic line art animation results: (a) Input owl image guidelines (b) Hypnotic line art animation result with our three different flow patterns (c) Input yin-yang image guidelines (d) Yin-yang hypnotic line art animation with Adjacent Flow pattern. *(Animation, best view with Adobe Acrobat Reader)*

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1 Introduction

Hypnotic line art, by Canadian artist Patrick Seymour, is a digital art style using single-color lines to create an interesting painting. To automatically create such artwork, [Yeh et al. 2022] developed an interactive system for generating hypnotic streamlines, making it easier for users to draw strokes to generate streamlines on contour images.

However, the true hypnotic optical illusion requires the stroke to be animated to achieve its maximum effect (like the hypnotic circle used for real hypnosis). Manually creating such smooth and continuous animation is a time-consuming and challenging task, even for experienced artists. In this work, we propose a system that makes it possible to generate hypnotic line art animation. Figure 1 shows the results of our generated hypnotic line art animation. The line flow direction is based on the arrow drawn by the user. Specifically, we identify three different types of streamline flow: Adjacent Flow, Wave Flow and Key Frame Flow. Each flow produces a unique type of visual effect. By mixing and composing them in a single artwork, we can transform the static hypnotic line art into a new and intriguing art form.

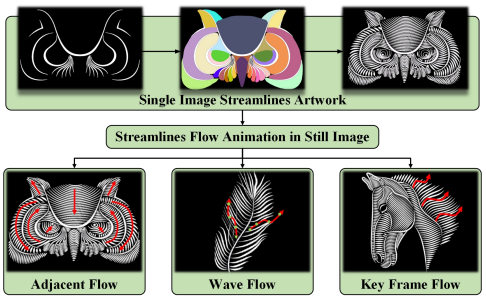

Figure 2: Hypnotic line art animation workflow.

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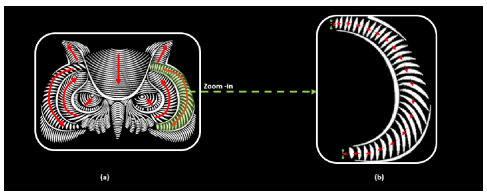

Figure 3: Adjacent Flow scheme. (a) Animate an owl with the Adjacent Flow. (b) Zoom in on the highlighted area. Streamlines flow to each adjacent streamline.

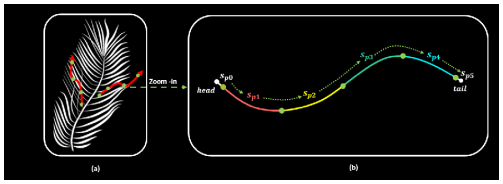

Figure 4: Wave flow scheme. (a) Animate a leaf with Wave Flow. (b) Zoom in on the specified streamline.

2 Method

The pipeline of our Hypnotic Line Art Animation is shown in Figure 2. Our system starts by generating a single image streamlines art using WYSIWYG method [Yeh et al. 2022] and we let the user to patch every area in contour image and annotate the input image with the following streamline animation.

Adjacent Flow. In Adjacent Flow, streamlines move in tandem in the direction perpendicular to the streamline itself including both forward and backward directions. Figure 3 shows the scheme of adjacent flow. We first define the original keyframe A and a duplicated target keyframe B and we give every streamline in keyframe A and keyframe B an index i. The animation is generated by moving ith streamline in keyframe A to the $i+1$th streamline in keyframe B. Besides, we extrapolate the streamlines on the boundary (Figure3 (b) green line) to avoid the border flickering effect.

Wave Flow. The Wave Flow animation is designed to generate movements similar to hair, wave or river flow. Figure 4 shows the Wave Flow scheme. To ensure a smooth motion, we first split a streamline into several segments. Wave motion is achieved by propagating wave pulses along the streamlines in an endless loop. Figure 4 (b) shows a streamline divided into 4 segments. To make the wave flow more realistic, we incorporate a physically-based simulation engine (we use Box2D in our experiment) into our system to simulate waves with spring-mass system. We superposition calculated position based on wave pulse and the simulated result as our final movement. Figure 5 shows a simulated wave result.

Key Frame Flow. Key Frame Flow allows users to customize the streamline movement by inserting intermediate keyframes. The interface allows users to easily adjust streamlines' position, rotation, length, and curve shape. Figure 6 shows the scheme of Key Frame Flow. Given the user input, our system will automatically generate in-between frames for smooth animation.

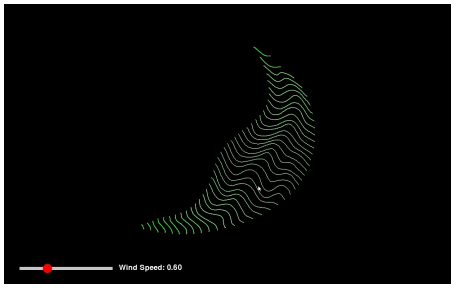

Figure 5: Wave flow simulated with Box2D simulation engine. With the simulation procedure, wave flow comes up more naturally. *(Animation, best view with Adobe Acrobat Reader)*

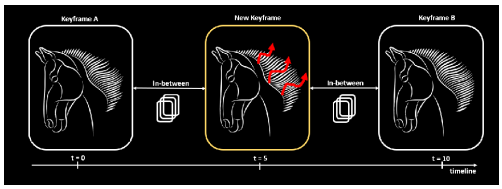

Figure 6: Key Frame Flow scheme. Users can insert any number of keyframes specifying the position of the steamlines. Our method can automatically create all the in-between frames.

3 Results and Conclusion

Figure 1 shows the three main types of streamlines flow in two different cases. The owl is animated in an interesting way with only a few input strokes. Compared to static hypnotic line art, our animated version provides a completely different visual experiences. **For the animated results, please refer to the supplementary video.**

In summary, we introduce a new animated hypnotic line art that adds another layer of diversity on top of existing static line art. We introduce three intuitive mechanisms for specifying streamline movement, significantly reducing the time and complexity of animation production. Our approach also tries to ensure the flow lines between key frames are fully aligned and temporally consistent, allowing users to easily generate smooth and coherent hypnotic streamline animation without extensive effort or expertise. Currently, our work can not always create a perfect streamline for Wave Flow animation and thus it sometimes needs manual adjustment to the in-between frame. In the future, we will try to adopt deep learning approaches to solve this problem.

Acknowledgments

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References

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