Project Progress Update

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1 Overview

The video shows a piece of paper that folds itself into a origami crane then flies off. Produced with stop motion, the video requires that supports and wires be used to hold the paper in position for capture of the frame. To remove the supports in each frame to make the paper appear to be folding itself, a combination of inpainting, matting, and poisson editing was used. The original plan involved the crane flying outside, but the current state of the video does not include this sequence.

2 Related Work

Stop motion is a style chosen for its aesthetics and production style. Films such as Coraline, Paranorman, Wallace and Gromit, Chicken Run, the Corpse Bride, and the shorts by PES such as Fresh Guacamole. Low cost and improved detail and texture are both factors in the choice to use stop motion, in addition to the distinctive style. The relative ease of production, subject matter (origami is fairly conducive to stop motion as it is static, positionable, and somewhat rigid in its movements), and cleanliness of the frames (i.e. no motion blur or similar effects) contributed to the choice of stop motion.

Inpainting and compositing are commonly used effects in the field of visual effects, and can be used in conjunction with stop motion to remove any wires, stands, and pieces that are used for structure, support and positioning but are not intended for the final cut. The techniques are described in Computer Vision for Visual Effects by Radke. Several inpainting techniques were used, including

3 Data Collection

Data was collected in mostly one burst. A camera was set up on a tripod overlooking the scene, which was then posed and photographed to produce the next frame. The camera was fitted with a 50mm prime lens, and was set with 1/30 shutter speed, f-stop of 13, and ISO 2000. A dark blue background was used for the folding shots as well as for the flapping wing sequence. Outdoor scenes are to be collected on the next clear (or somewhat clear) day to attempt to get blue skies.

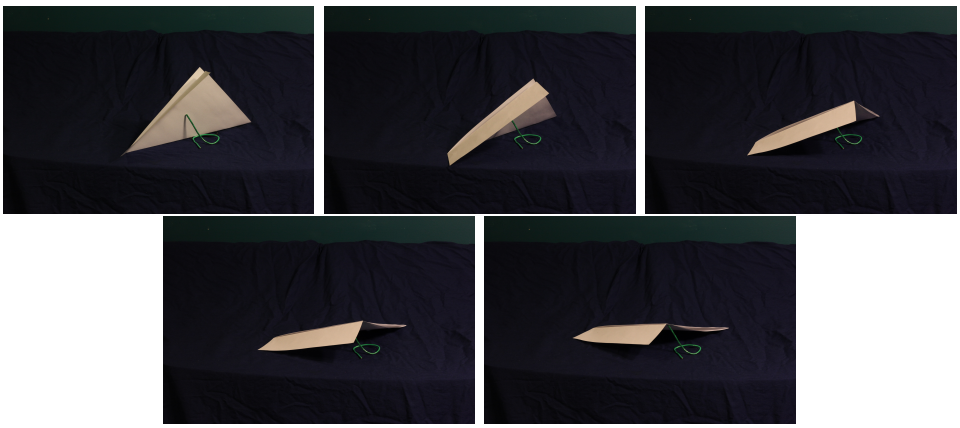
4 Technical Approach

The frames are captured with minimal supports for the model. Wires are used for propping up and manipulating the model frame to frame, ensuring controlled maneuvers. A static tripod setup was used to ensure consistency between frames.

Once captured, a combination of inpainting, matting, and poisson image editing was used to produce the final frames. The general case was that there was a wire that could be inpainted, filling in the background and some minor sections of the crane. This was performed using several passes of inpainting, utilizing a combination of OpenCV's inpainting function and the GIMP resynthesizer plugin.

5 Sample Frames

5.1 Example Sequence



5.2 Successes and Ideal Cases

5.3 Failure cases

5.4 Example of combination of effects to produce final frame

6 Future work

The original plan involved the crane flying outside, but I spent instead a lot of time getting the indoor sequence to look good with various tweaks. Ideally the final sequence of the crane flying outside into the sky would be completed and added. The current video also does not contain the last few frames of flight after the crane is completed, as I ran out of memory during the video creation. As I was making this I actually thought that it would have been cooler to have started with a picture of a seagull, crane, heron or pigeon and perform a morph from the bird to a crane which then flies inside and unfolds itself, but unfortunately I didn't think of this soon enough.

References

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[2] Patrick Pérez, Michel Gangnet, and Andrew Blake. Poisson image editing. *ACM Trans. Graph.*, 22(3):313–318, July 2003.

[3] Carsten Rother, Vladimir Kolmogorov, and Andrew Blake. "grabcut": Interactive foreground extraction using iterated graph cuts. *ACM Trans. Graph.*, 23(3):309–314, August 2004.

[4] Alexandru Telea. "an image inpainting technique based on the fast marching method.". *"Journal of graphics tools"*, pages 23–24, 2004.