

Automatic Inbetweening for Stroke-based Painerly Animation - Supplemental material

Two workflow examples are depicted in the video `workflow.mkv`.

The supplemental materials present 9 animations obtained with our automatic inbetweening approach. Some animations demonstrate basic motion, while others reveal the limitations of our method in complex scenes. We used different animation structures, including layered animations with different motions or animations contained within a single layer.

Each animation directory is organized as follow:

- `{number}_AnimationName`: the number prefix is here to suggest watching order
 - `AnimationName[Version].mp4`: Rendered animation, with two version for `BeachBall`
 - `keys`: directory containing the keyframes images
 - * `[LayerNames]`: one directory per layer, if the animation has layers
 - `keyframe-{frame_time}.png` keyframes, with `frame_time` the position of the frame in the timeline
 - `motion`: contains `original.mp4` the colorized forward motion of the source animation, `extended.mp4` is the extended version, if used.

The colorized motion flow use `motionColorWheel.png` to map vector direction to color (we adapted motion vector normalization for each motion field).

01__AppleTranslated

- The AppleTranslated animation consists of 52 frames with 6 keyframes within a single layer.
- The animation depicts a simple translation.

02__Pizza

- The Pizza animation consists of 52 frames divided in two layers (dought and toppings) with 6 keyframes per layer.
- The animation depicts a clockwise rotation without any occlusion.

03__Zoom

- The zoom animation consists of 52 frames with 5 keyframes within a single layer.
- The animation depicts a zoom.
- The keyframes uses smudges strokes that are reproduced in generated intermediates frames.

04_BeachBall

- The BeachBall animation consists of 52 frames with 6 keyframes within a single layer.
- The animation shows some subtle jumps of paint at keyframes, which corresponds to paint visibility updates.
 - These jumps are caused by the paint advection that overflows the object's shape. This is proportional to the precision of the motion field used.
- An edited version of the animation, where accumulated strokes are manually erased, shows that generated intermediate frames can be easily edited to avoid these jumps.

05_AppleShaded

- The AppleShaded animation consists of 52 frames divided in 2 layers (one for shadows motion and specular, and one static layer) with 11 keyframes for shadows and specular, and 6 for the static part.
- The static layer animation depicts line boil effect.
- Shadow and specular layer depicts illumination changes, their motion field are computed in blender using moving 3D shapes that follow shadows and highlights.

06_Ellie

- The Ellie animation consists of 61 frames with 8 keyframes in a single layer, where each keyframe is composed of one thousand strokes.
- The rendered motion field from the associated Blender 3D scene did not provide motion information for the hair tip area.
 - To address the lack of motion, the tips of the character's hair were repainted in all frames.
- The keyframes stokes were painted in different order, some starting with intricate details and others starting with rough shapes.
- The motion field does not account for acceleration, this results in shape duplication in areas where the acceleration is high, particularly noticeable in the eyes and earrings regions.
- There are paint holes in the character's hair in the keyframes that are not accurately reproduced in the generated intermediate frames. Our method is designed to reproduce the style of the keyframes in the filled regions.

07_Alley

- The Alley animation consists of 50 frames divided in 4 layers: one for the background, one for the architecture, one for the ground and the last for the moving character.
- This animation uses an optical flow extracted from the 3D movie.

- This animation exhibits some limits of our approach through a complex motion combining complex character motion and camera motion, especially near the moving character. Furthermore some global flickering effect at keyframes can be perceived which results directly from the way how keyframes were painted.
- The layer of the character was cleaned by hands to remove bad strokes. No strokes were added, they are all generated by our method.

08_SeaBall

- The SeaBall animation consists of 51 frames divided in 3 layers: one for the sky, one for the sea and one for the bouncing ball.
- This animation uses a drawn motion field for the bouncing ball layer (shown in `drawnMotionField.png`).
- The sky is fixed, without intermediate frames.

09_Fluid

- The motion field comes from a 3D fluid simulation computed with Blender.
 - The source.mp4 depicts a basic 3D rendering of the scene from which the motion is extracted.
- The motion field computed by blender only captures approximation of fluid surface speed, hence keyframes have been designed so that actual motion between them matches.
- Two examples are provided :
 - The Fluid_01 animation consists of 41 frames with 2 layers: one for the background (two keyframes), one for the fluid (8 keyframes).
 - The Fluid_02 animation consists of 11 frames with 3 layers: one for the background (fixed); one for the shadow (each frame are hand drawn); and one for the fluid (3 keyframes).