

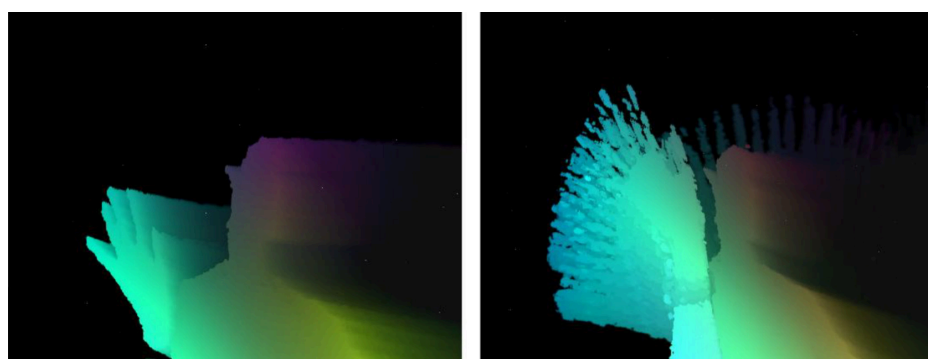
Smother Interactive Art

making a depth camera feed smoother in real time



Problem

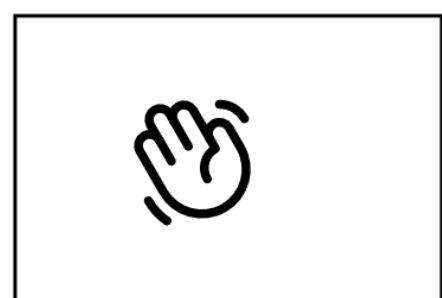
For some interactive art installations, 60 FPS is not always enough to create a visually smooth experience for the viewer. For example, in the artwork *Virmalised* (below) the previous frames are echoed on the screen to create a soft aurora-like trail effect. This works well during slow movement, but fast movement exposes the gaps between captured frames: the trail becomes visibly stepped and the intended smooth effect breaks down. Because the framerate of the camera is capped, the challenge is to synthesize intermediate frames between the existing ones so the artwork remains fluid, even with faster motion.



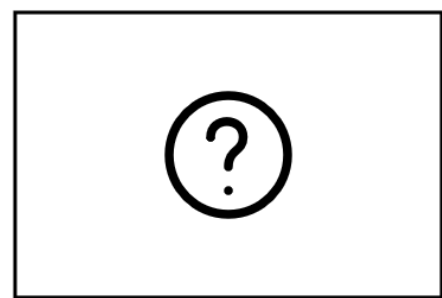
slow motion

fast motion

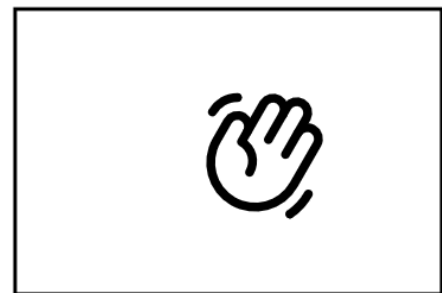
Goal



frame 1



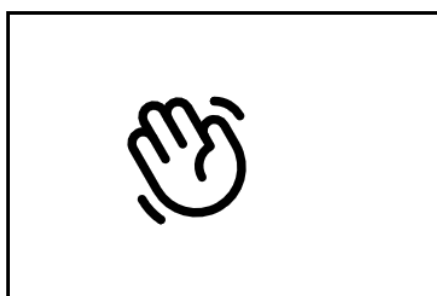
how to find out what happens here?



frame 2

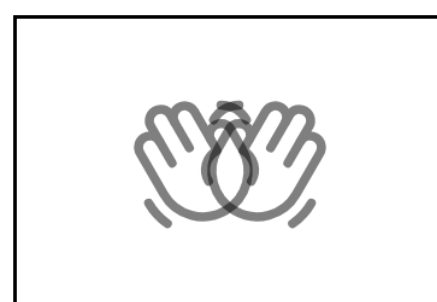
Methods

A Just repeat frames



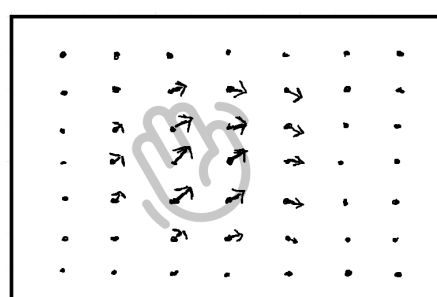
- + no computation needed
- + very easy to implement
- no actual info generated

B Linear blending



- + computationally fast
- + very easy to implement
- output is usually not accurate

C Optical flow



- + motion guided blending yields an accurate output
- computationally more complex

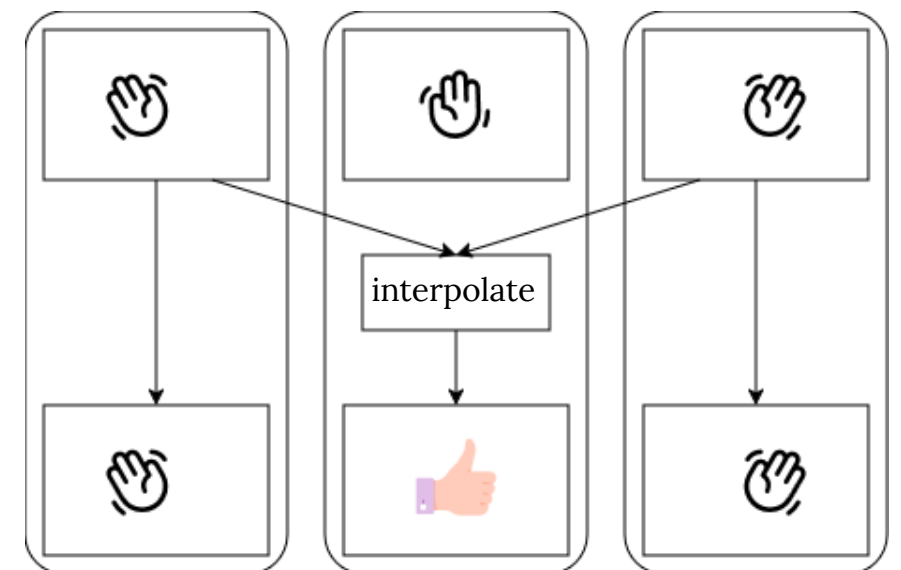
D Deep learning



- + output can handle complex motion well
- needs to be trained
- usually slower than traditional methods

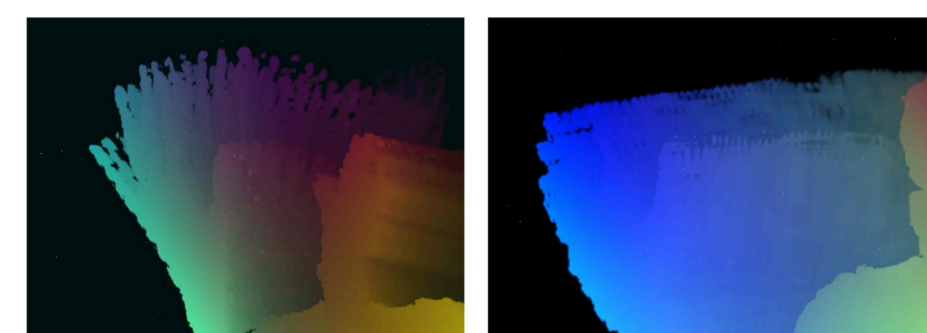
Experiment

To test each method in a qualitative fashion, they were tested on prerecorded sequences. The test videos were sampled at half the frame rate, this way there was a ground truth frame to test the outputs against. The sampled frames were inputs to the methods selected for this experiment. For each method, a cumulative score was calculated. This score summed the differences between the pixels of the ground truth and the respective interpolated sequence.



Results

Despite its computational complexity, the deep learning model used in this experiment was clearly the best out of the other three. The optical flow based approach was unreliable due to the sharp nature of the depth frames, making it virtually similar to the frame repetition method. Linear interpolation had comparatively good error scores but visually, the output had a lot of ghosting during faster motion.



without interpolation

with interpolation
(deep learning method)

