Final Project Presentation: Video Sprite Replacement

By Nancy Wang

Problem

- A popular thing in do to, in various media such as internet videos, is to combine live-action with animation.
- However, it can be time consuming/costly to draw/model out the animation separately and then put it in the video.

Motivation

- It's interesting to try to animate cartoons and such without drawing out everything by hand. It's difficult to do since the poses might not match or the motion can be very complex.
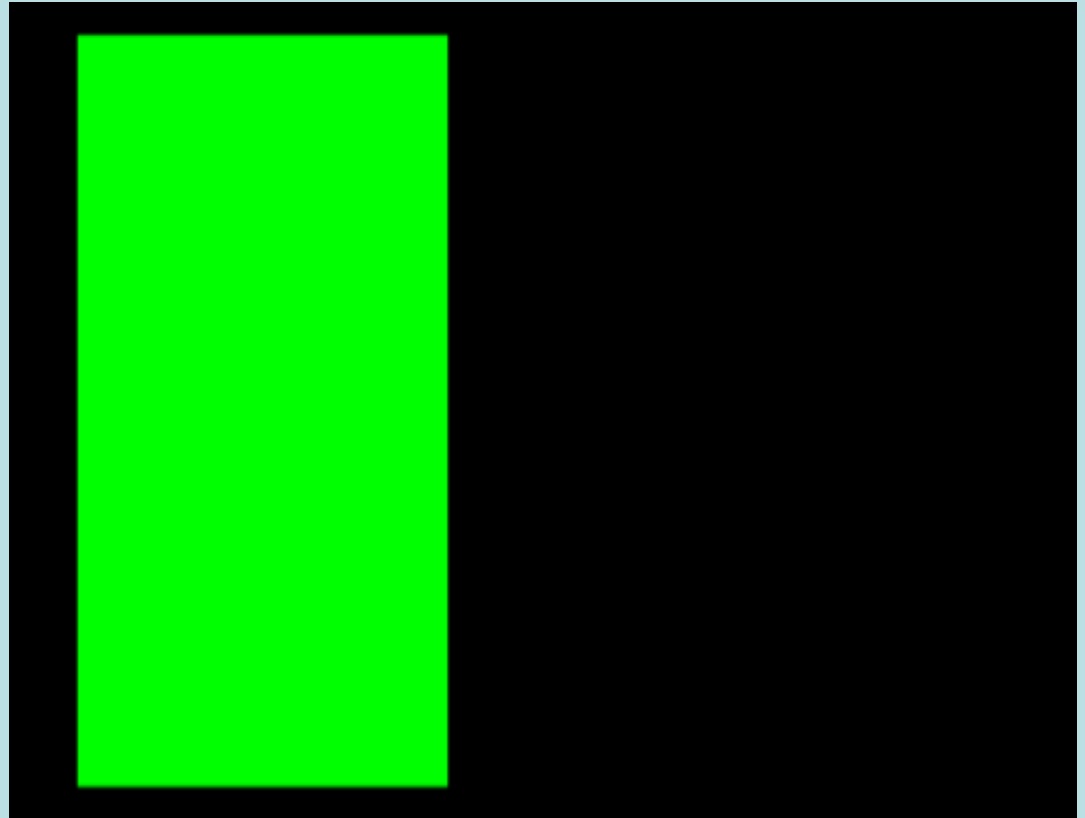
Approach

1. Rotoscoped person

   Through Adobe After Effects
   Used rotobrush tool to obtain the rotoscope masks of the person running

Approach(cont.)

2. Attach marker to motion

- In Adobe After Effects, tracked motion of jogger
- Apply motion to green box marker(used later in matlab)

Approach(cont)

Matlab Code Process: Focus

Note: Videos are difficult to handle in MATLAB

had to convert frames to images

Focus on matching the poses of the cartoon sprites to the original person from the video

Approach(cont)

- Inputs:
  - Array of key scene images
  - Array of greenBox marker images
  - Array of toon sprites
    - Number of toon sprites not necessarily same amount as the number of key frames.
    - Main idea is to extract key shapes of real-life person and match to toon sprites accordingly

Approach

- Procedure:
  - ○ Iterate through image and GreenBox marker arrays
  - ○ Automate key-sprite extraction
    - ■ For each image
      - ■ Detect position of GreenBox
      - ■ Obtain key sprite by cropping image according to marker
      - ■ Build key sprite array

Approach

- Procedure(cont):
  - With each key_sprite from image, compare with each toon pose in Toon Sprite Array
    - Use affine parameters to compare poses to calculate error

$$err_{aff} = \sum_{s_i \in S} (I_t(A \cdot s_i + D) - I_0(s_i))^2$$

$$I_t(A \cdot s_i + D) \approx I_t(s_i) + [I_x(s_i), I_y(s_i)] \cdot (A \cdot s_i + D)$$

$$H_i = [I_x(i) \cdot x_i, I_x(i) \cdot y_i, I_y(i) \cdot x_i, I_y(i) \cdot y_i, I_x(i), I_y(i)]$$
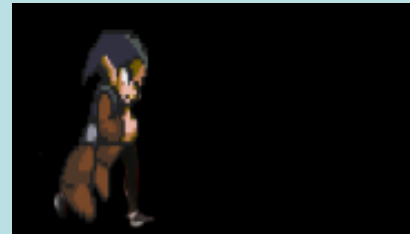
$$z_i = I_t(i) - I_0(i)$$

$$\theta_{aff} = (H^T \cdot H)^{-1} \cdot H^T \cdot Z$$

Approach

- Procedure (cont):
  - After calculations, match the toon sprite to the current key sprite with the least amount of error
  - Insert new toon sprite into scene.

Results

Replaced Sprites

Future Work

-Should apply control joints for better accuracy

-extend to more complex motion such as facial expressions