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Sprite Replacement and Stylization

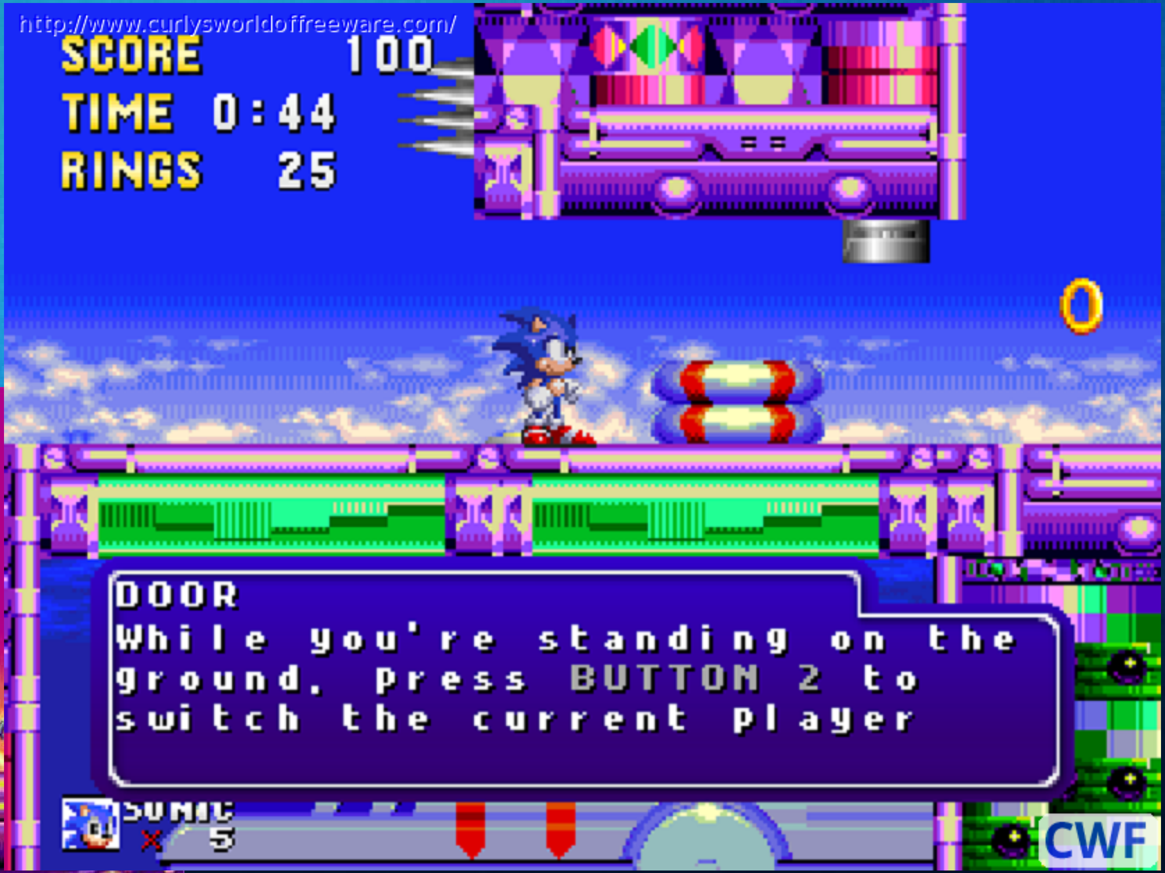
Problem

- Games provide little personalization given all the possible input sources available
  - Webcams
  - Microphones

Motivation

- We want to make games more personal
- Take images of the player and insert them into the game
    - Alter Images to maintaining the game style

The Game: Open Sonic


http://www.curlysworldoffreeware.com/

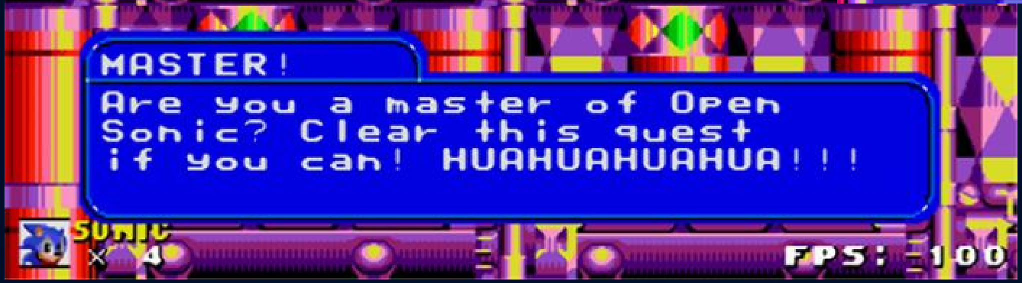
SCORE 100
TIME 0:44
RINGS 25

DOOR
While you're standing on the ground, press BUTTON 2 to switch the current player

SONIC × 5

CWF

SCORE 0
TIME 0:06
RINGS 0


MASTER!
Are you a master of Open Sonic? Clear this quest if you can! HUAHUAHUAHUA!!!

SONIC × 4

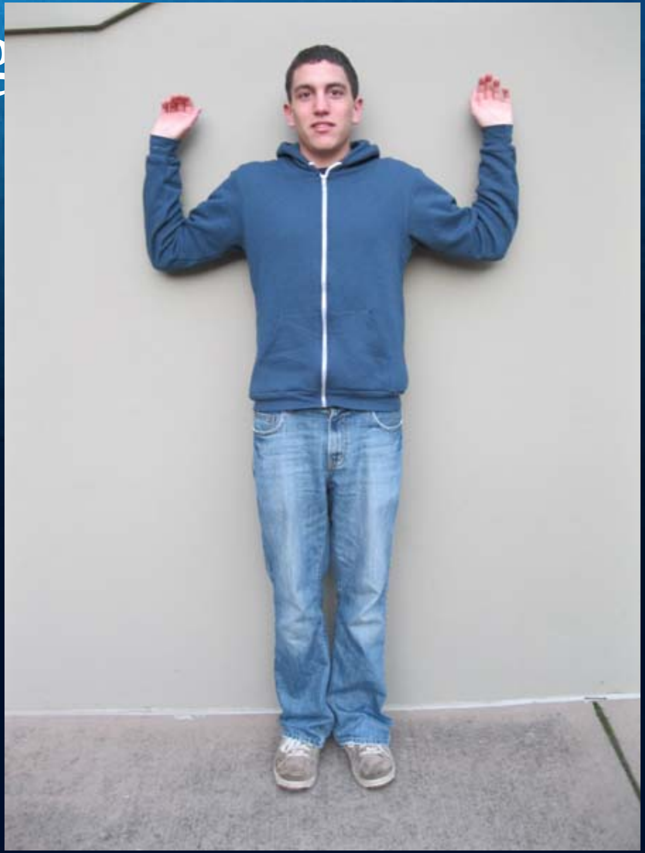
FPS: 100

Approach Overview

1. Input: images or video of player performing actions
2. Sonic Template Replacement
3. Alpha Matting / Adjust Contrast and Gamma
4. Stylize the image to fit an arcade game
5. Put the image into the correct sprite file

Player Performing Actions

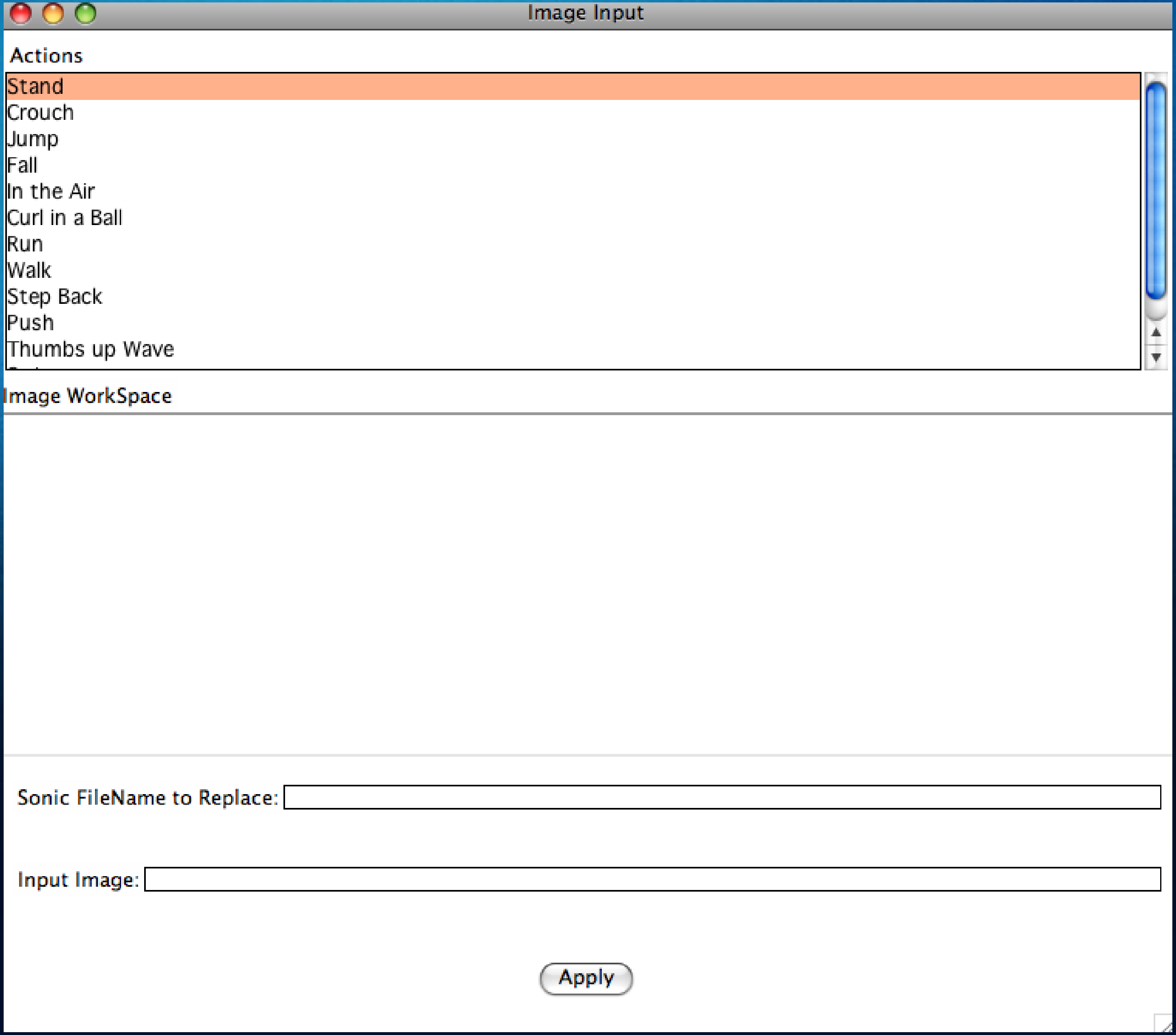
- All actions are taken by the user
- Pictures or video should be taken next to a solid color background
- If input is video, user needs to run our AppleScript to become an imag sequence.
    - ○ Video should only be a few seconds long.



Replacement of Sonic Images

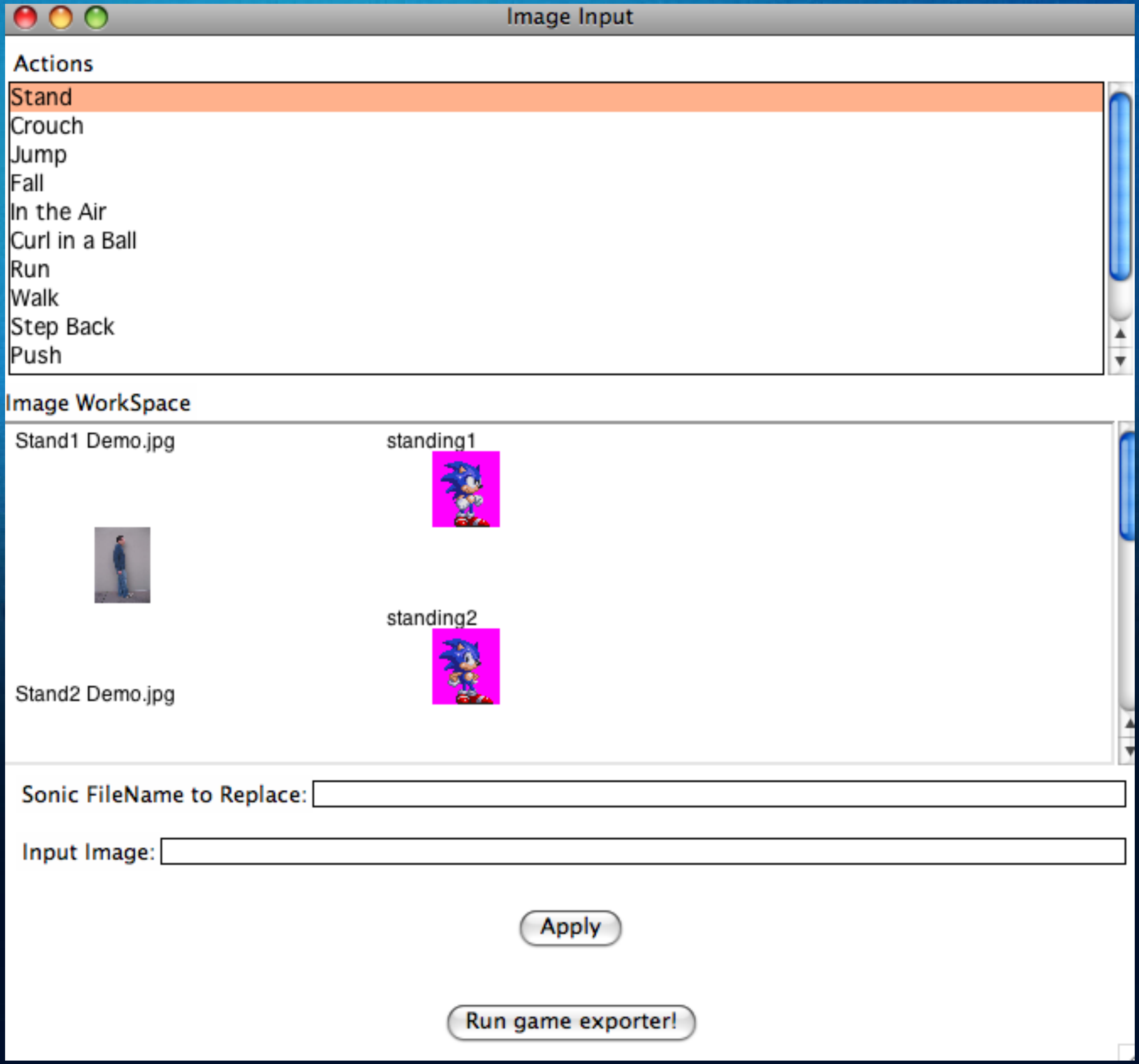
- Interface:

- User chooses action.



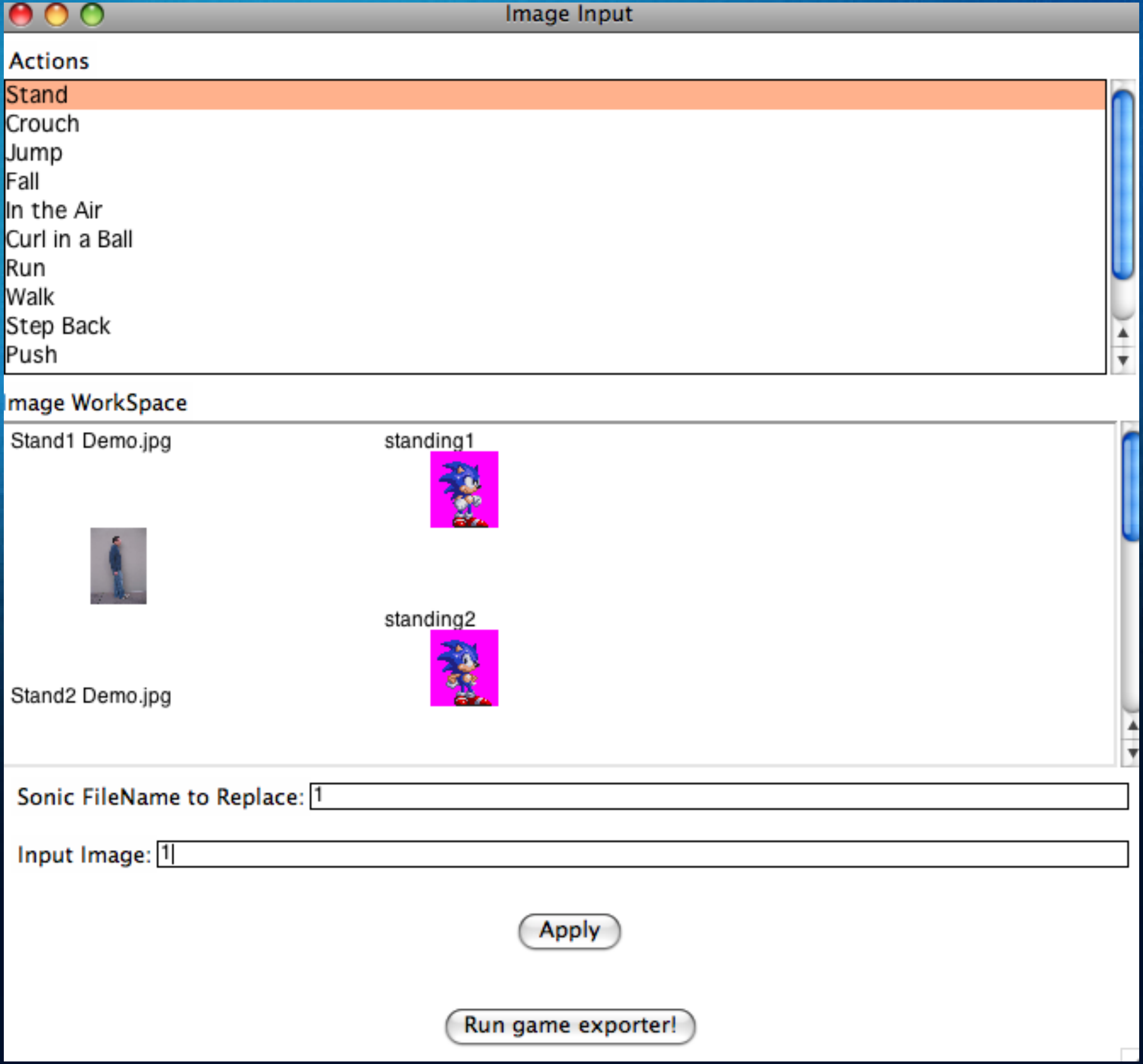
Replacement of Sonic Images

- Interface:
- Possible Images become displayed



Replacement of Sonic Images

- Interface:
- Type in image index to save and rename image



Sonic FileName to Replace: 1

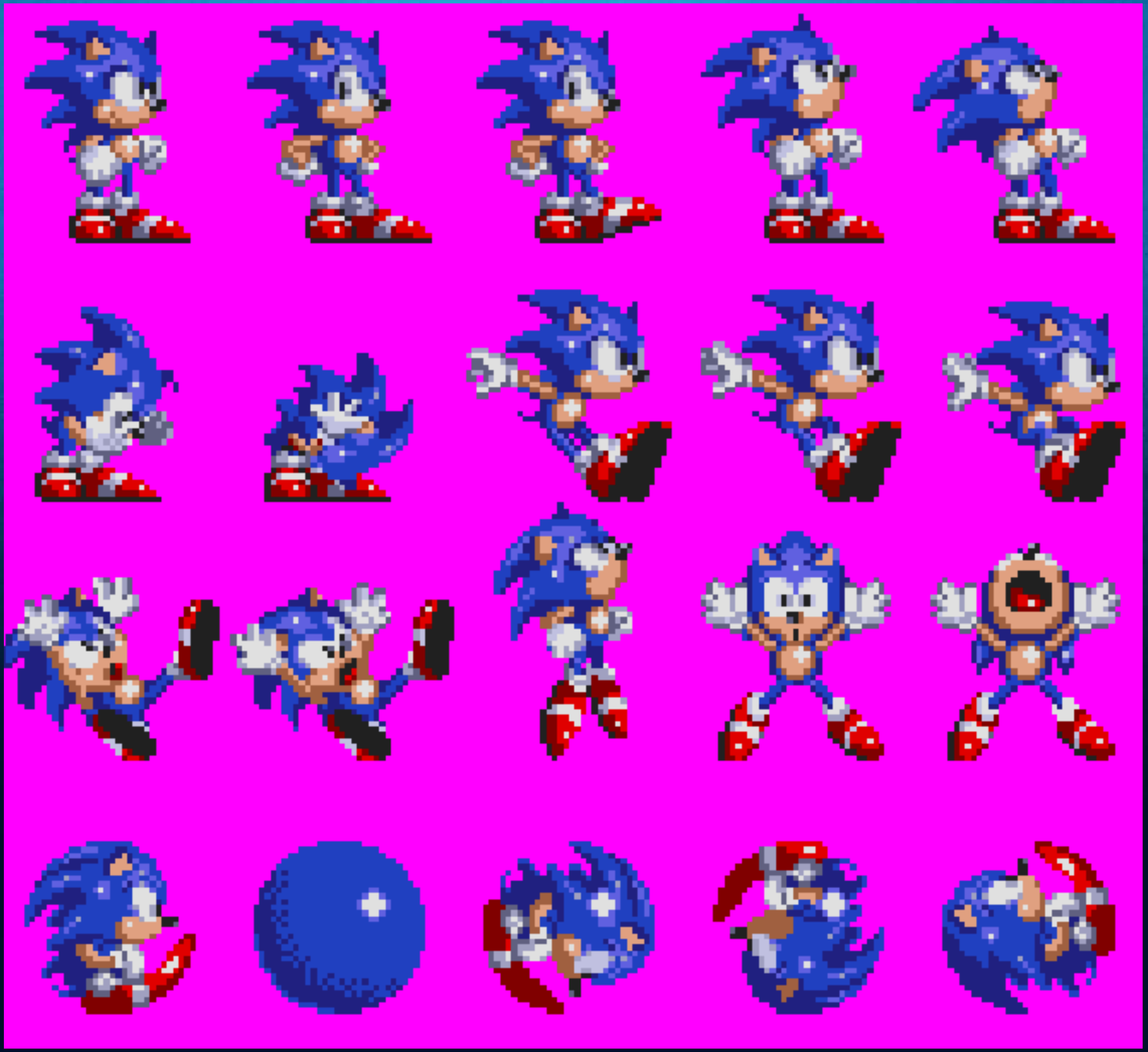
Input Image: 1

Alpha Matting / Adjust Contrast and Gamma

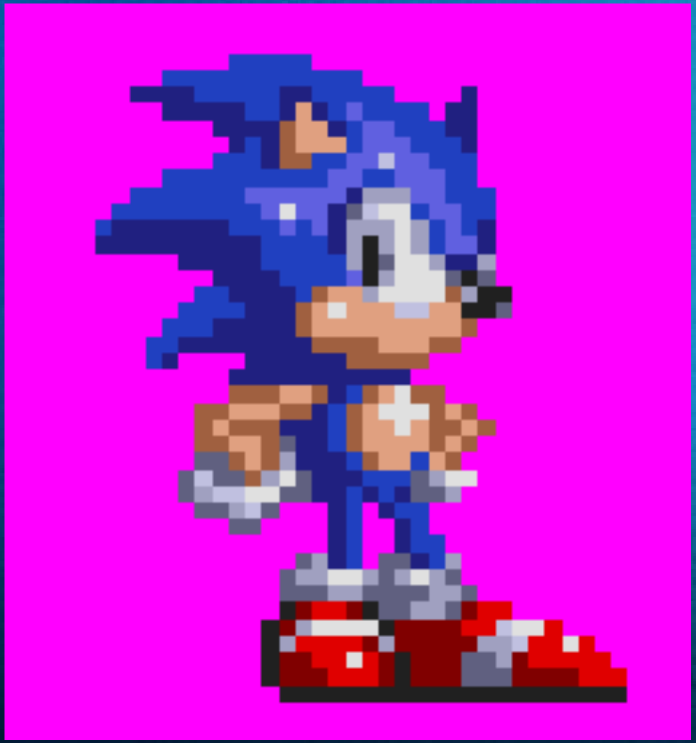
- User manually alpha mattes each saved image that was provided by the interface.
- User adjusts color based on one select image
- We used PhotoShop/Seashore
    - User experience bottle-neck

Image Stylization

- We want the user's image to look like they fit in the game



Properties of a sprite



- Low-res
  - 40x45 pixels
- Operates in the 8bit color space
- Has a limited number of colors
  - ~7-12

Given an image how do we stylize it?

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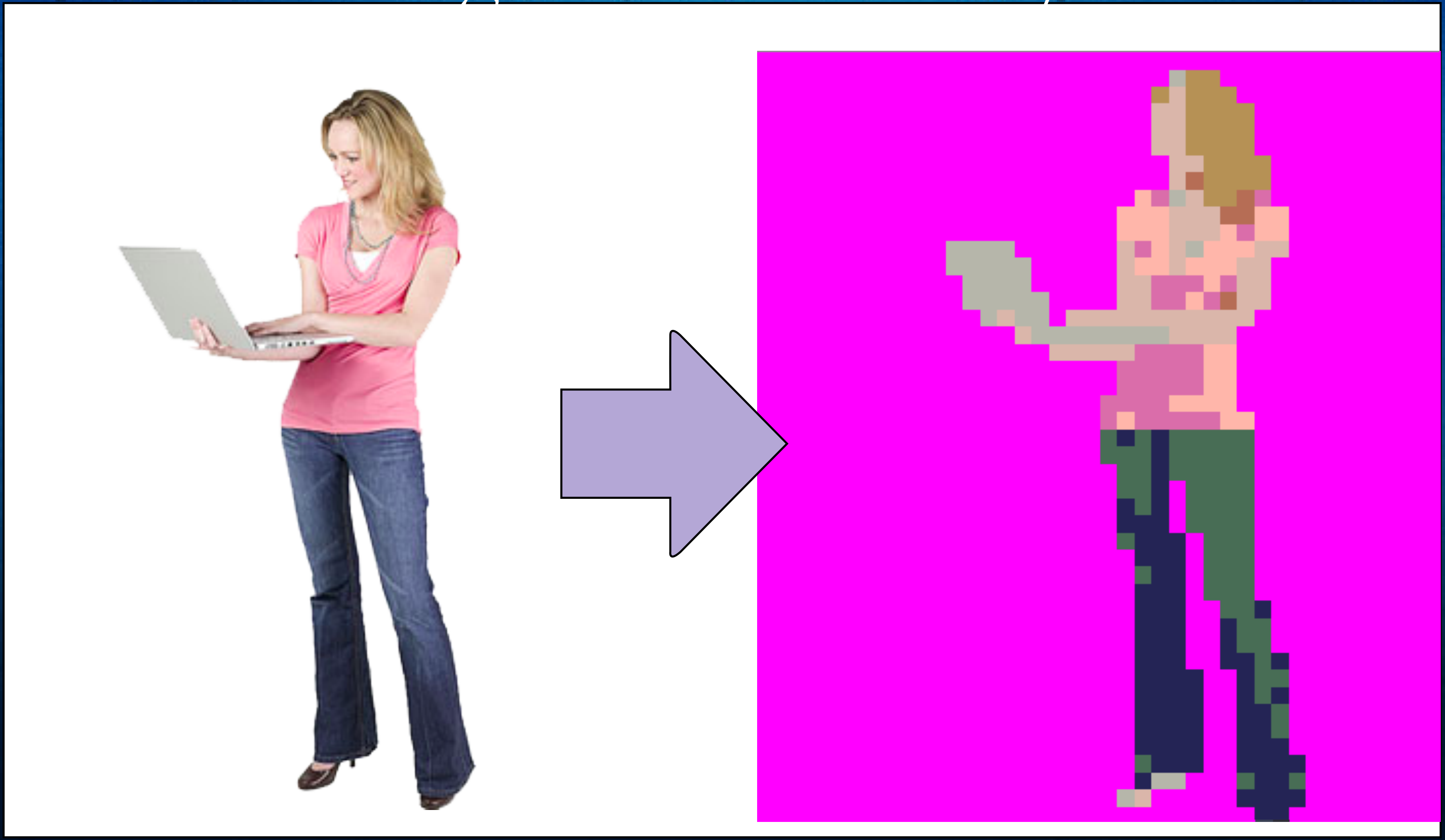
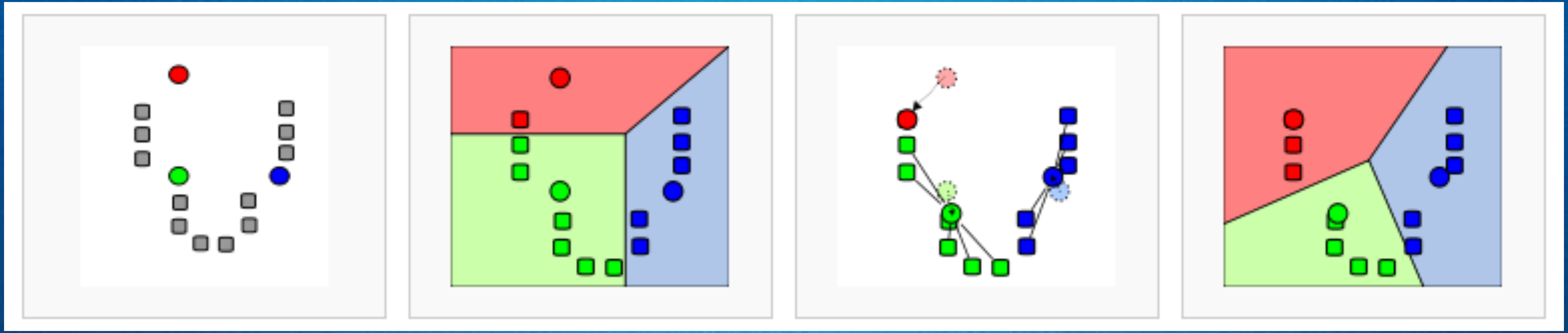


Plain resize

- Too much detail
- Looks weird when put into game

Merging similar colors

We use k-means clustering to merge similar colors



1. Pick initial means for each cluster
2. Assign each pixel to closest cluster (least squares in LAB)
3. Re-calculate cluster means
4. Repeat steps 2 and 3 until convergence

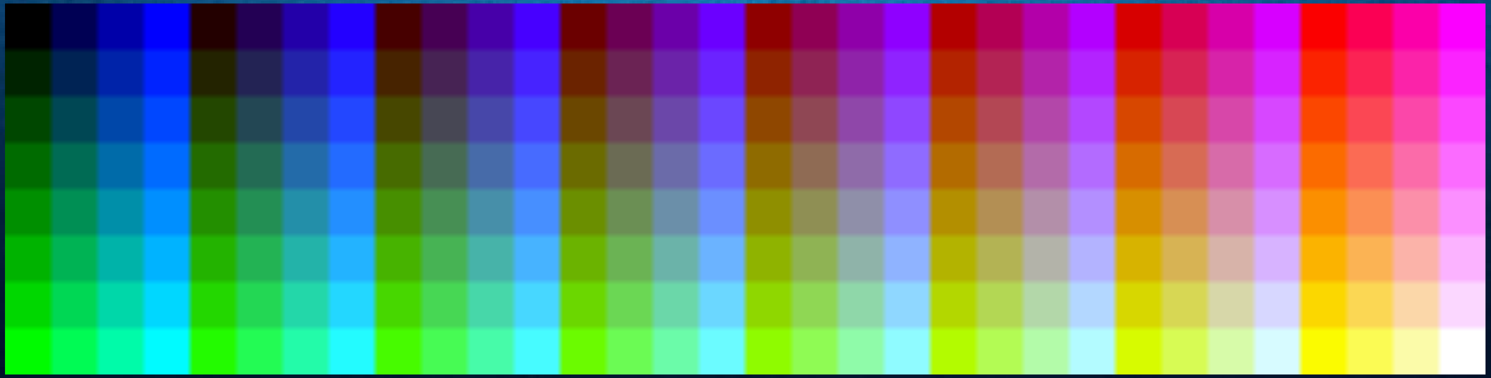
Picking Initial Means

- We want to encourage common but varying cluster colors
- Each unique color in the scaled image is assigned a score:
  - min_diff = minimum least squares from clusters chosen so far
  - score = log(# of occurrences + 1) + c * log(min_diff + 1)
- The color with the maximum score is chosen as the next cluster's initial mean

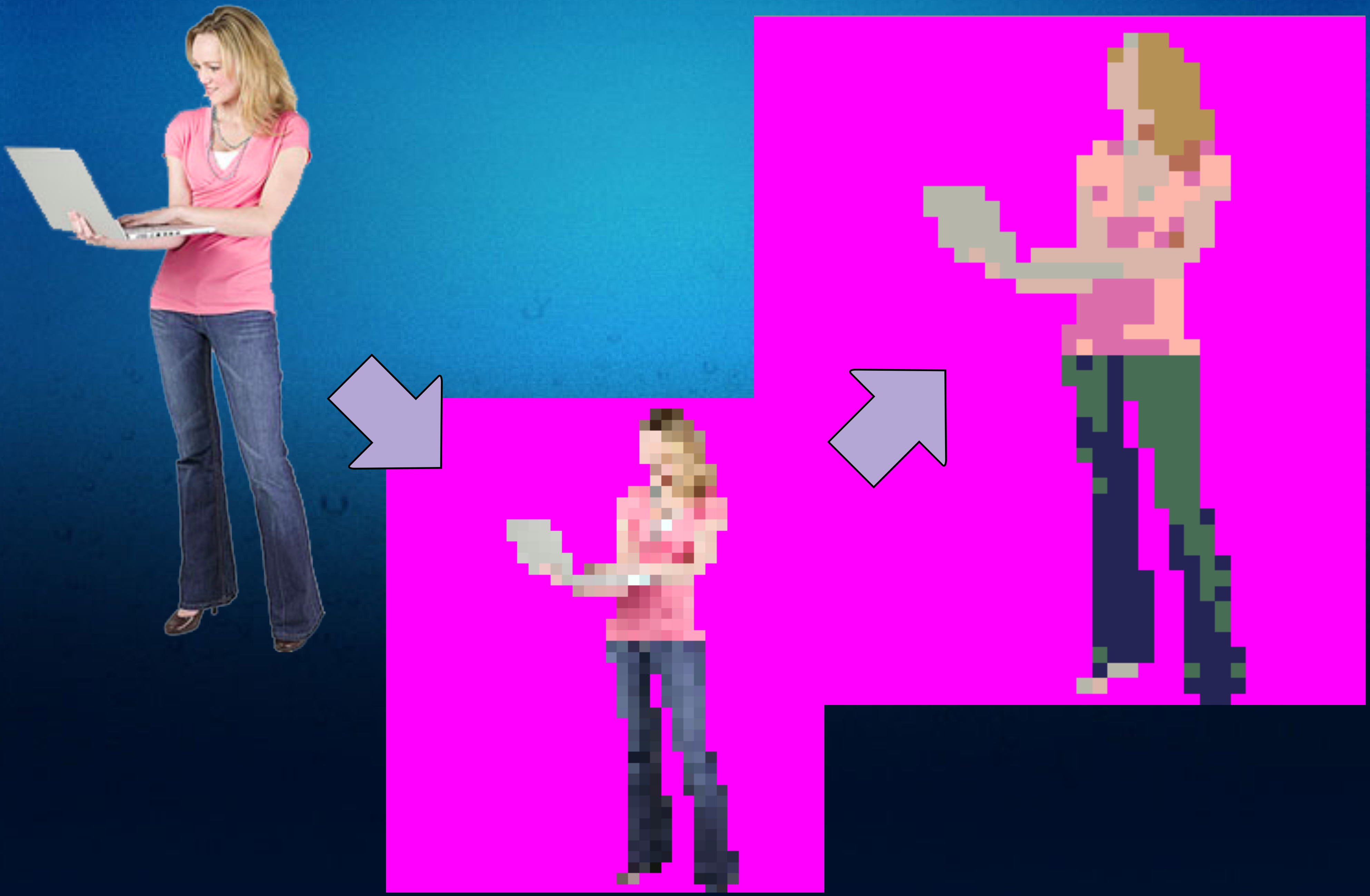
8-Bit colorspace

True Color (> 16mil): 10110110 00111001 11001010

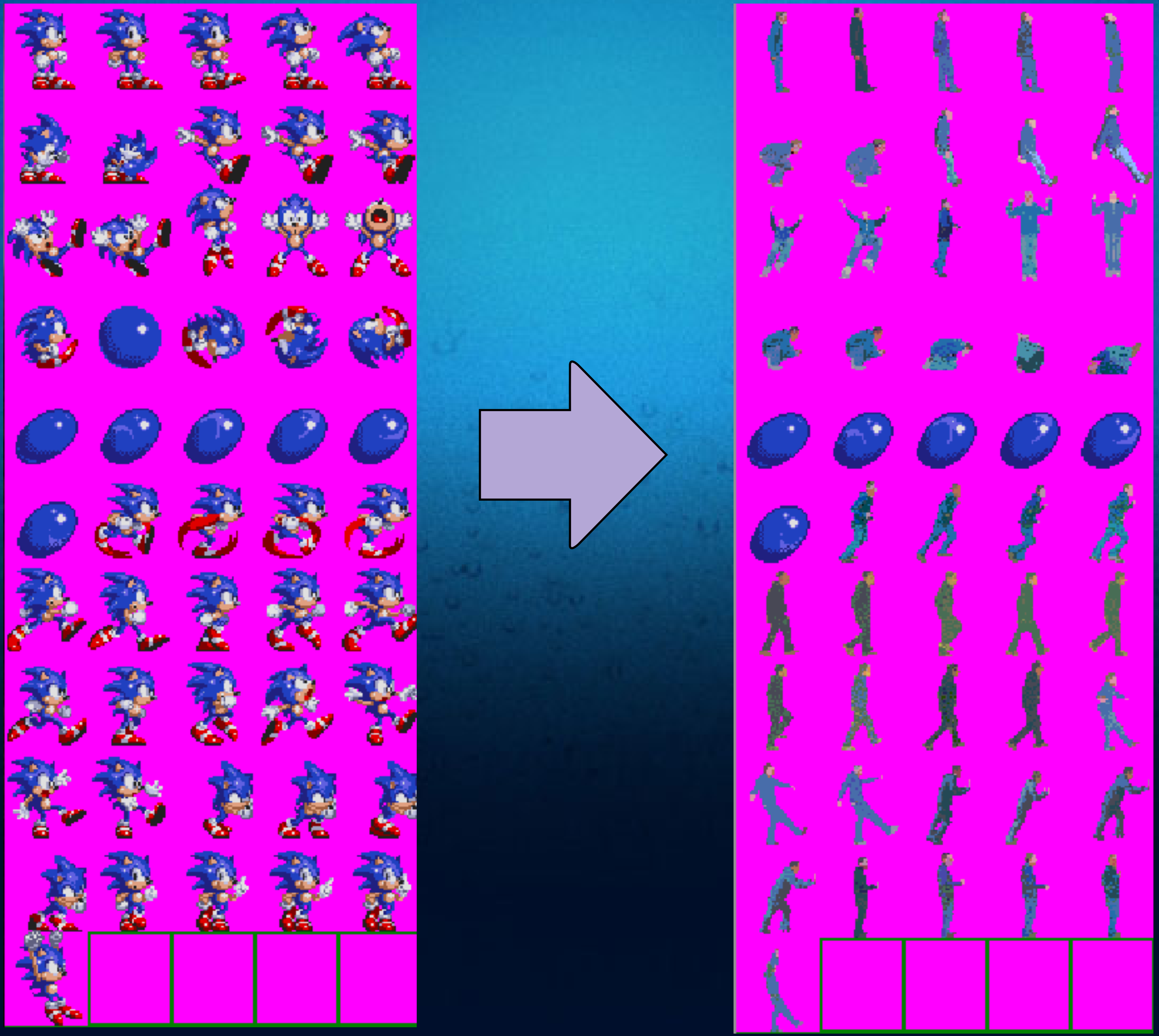
8Bit Color (256): 011 010 11



Stylization Results



Replacement



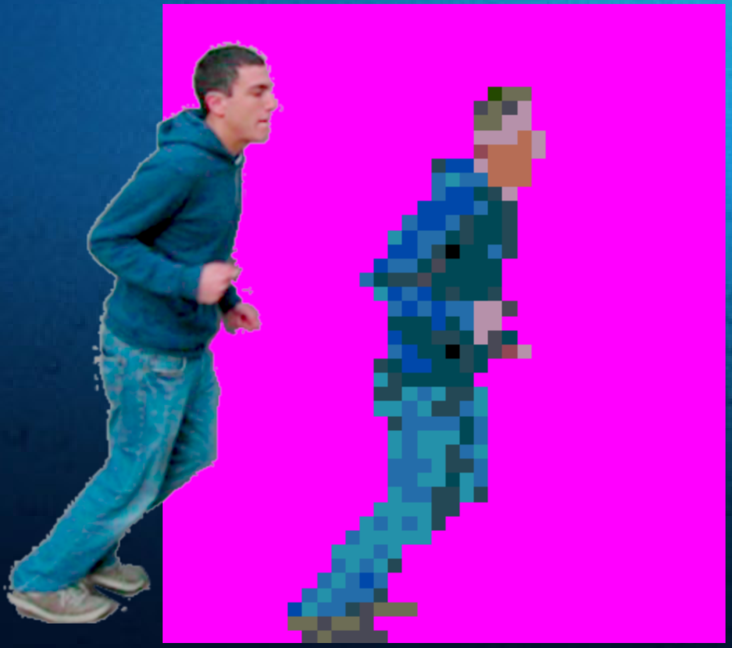
Demo

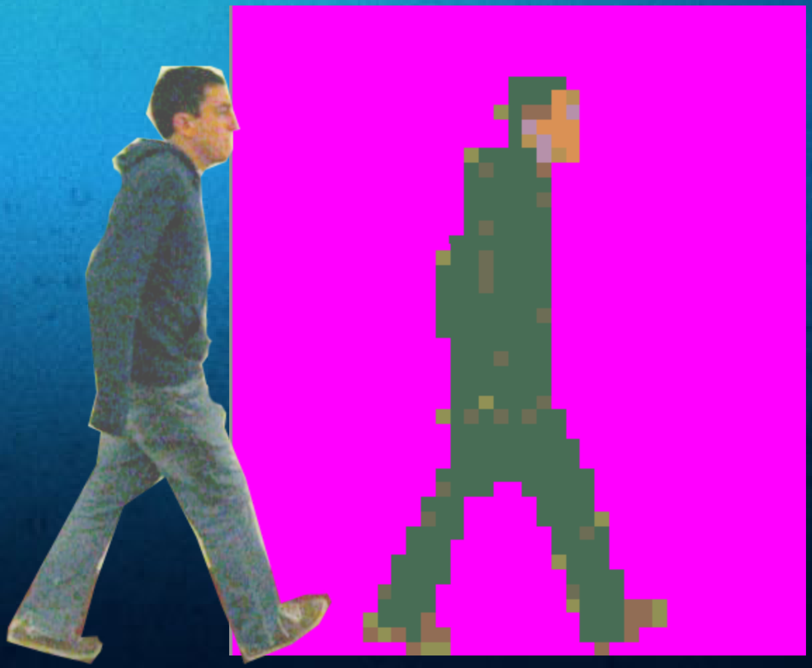
Future Work (user interface)

- Automate the replacing action images
  - Current: UI displays all possible images for each action. The user types in the corresponding best match.
  - We would want to do an automated matching in case lots of images are inputed.
    - Video entails a lot of images.
- Improve Alpha Matting
  - Current: User has to use PhotoShop.
  - Want each action to be displayed and user just draws lines for foreground and background

Future Work (Stylization)

- Temporal coherence
  - ○ Lighting conditions aren't necessarily consistent with auto exposure or using multiple capture devices





- Emphasize features
  - ○ Make head, feet, and hands more prominent

Questions?