Telescope

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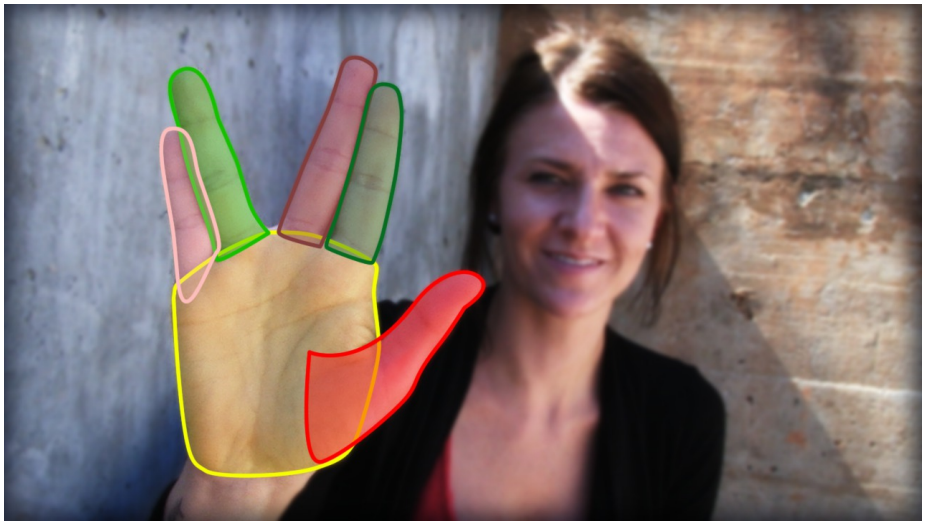
Intro

Telescope is a machine learning assisted toolkit for digital video compositors with applications in visual effects, matte painting and diverse use cases accross the video post production pipeline. Tools from existing compositing packages will interact with a novel ML core to assist or completely automate the rotoscoping process. Rotoscoping is the process of masking and segmenting poritons of an image accross multiple moving frames, any feature length movie will often consist of hundreds of rotoscoped shots with multiple tracked mattes per image, and this is the primary job of thousands of roto artists accross the world.

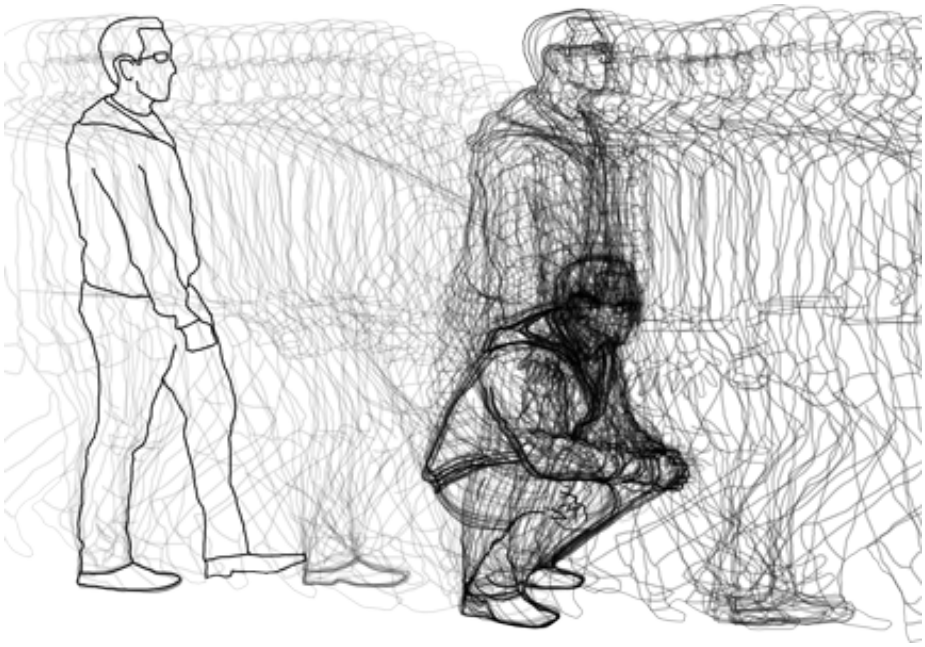
We hope to make this process, fast, intuitive, and accesible to alleviate the manual and time consuming process that makes up a huge chunk of the man hours required to produce even low budget features. We believe that machine learning is in the process of revolutionizing image processing, and that user driven toolkits rather than black box command line workflows will bring our intelligent core into the hands of the artists where they can thrive.

Demonstration

Here is an example of several features on an image, segmented or masked on a single frame, this is the atomic process of rotoscoping.



When this process is repeated, or rather modifyied for each subsequent frame in a video, you can produce a video of any isolated feature on a transparent plate for further compositing.



This image shows how masks can change with the movement of a distinct feature, namely a figure isolated in every frame of walking to sit. It is highly noteworthy that both of the demonstrated processes are done completely by hand, which we aim to make obsolete.

Technical Plan

Components

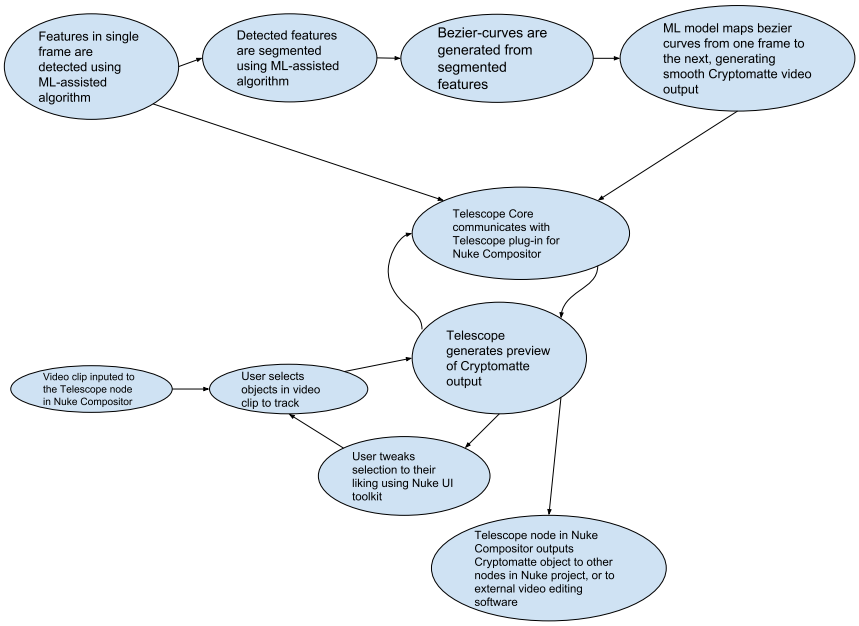
Telescope as a product will consist of two primary modules, the Telescope Core, which is a machine learning core assisted by traditional algorithmics that implements the novel functionality of Telescope, and an exchange plugin that allows existing professional compositing tools to interact with our proccesses. Telescope For Nuke is our chosen example exhange plugin, designed to demonstrate how the Telescope core can interact with existing artist workflows - but the separation of core and plugin is designed such that Telescope can be implemented into other software packages like Adobe After Effects or Blackmagic Design Fusion at a later date.

Category	What are we using?
Communication	
Email	Gmail
Web Conferencing	Facebook Video
Instant Messaging	GroupMe
Collaboration	
Document Collaboration	Google Drive
File Sharing/Data Tracking	GitHub
Plugin Development	
OS Supported	Windows, Mac OS, Linux
Host Application	Nuke
Development Language	C++
Machine Learning Development	
Development Language	Python
Packages	PyTorch

Algorithmics

The algorithmic core of our plugin will take images (frames of videos) as input and output segmentation masks (mattes) as output. The goal of the masks is to identify all the discrete objects in the image. It is class-agnostic and therefore does not need to determine what the objects are (e.g. cat or dog) but rather the fact that they are discrete. Our criteria for determining how well our model is accomplishing the task is the Intersection-over-Union metric (IoU). We have yet to determine what an acceptable IoU score is for industry applications. The model will be a convolutional neural network. Specifically, we will begin with the UNet model (https://arxiv.org/abs/1505.04597). Initially, our primary dataset to train the model with will be the Panoptic Detection COCO dataset, modified for a class-agnostic task. Further iterations of the model will take advantage of the additional information in EXR images to refine object mattes and the DAVIS video object segmentation dataset.

Dependency Model



Team

Roles

- Connor O'Hara: Image Processing (cohara1@stevens.edu)
- Kevin Poli: Application/ Artist Tools Developer (kpoli@stevens.edu)
- Philip Vitale: Application & Systems Developer (pvitale@stevens.edu)
- Brendan von Hofe: Machine Learning (bvonhofe@stevens.edu)

Advisors: Hong Man (hman@stevens.edu), Jeff Thompson (JThomps4@stevens.edu)

Delegation of Tasks

Connor O'Hara

Last Week

- Continue contact with Venture Center

  - we have a primary contact, but still waiting to be met with

This week

- Research Generative Ladder Networks

Kevin Poli

Last Week

- Acquire developer license for Nuke
  - Working on trial version until license is acquired

This week

- Follow along with Nuke developer tutorials, implement Nuke boilerplate

Philip Vitale

Last week

- Nuke API research
  - Noted and shared video tutorials and downloaded the manual

This week

- Follow along with Nuke developer tutorials, implement Nuke boilerplate

Brendan Von Hofe

Last Week

- Define image processing model

This Week

- Researching how to improve older partial solutions DeepMask/SharpMask
- https://github.com/facebookresearch/deepmask

Team

Updates

- Meet with Visual Arts department
  - Move forward taking them on as our client, Hong Man will remain Advisor
- Attend tech meetup for capital/business opportunity
  - Machine learning meetup October 4th