Video Processing Toolbox 视频处理器

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Introduction

This research lies on the intersection between neuroscience and computer science. The goal is to develop a user-friendly video processing toolbox to extract feature information from videos, which is crucial in visual cortex studies. This also endows researchers who know nothing about programming the chance to do video-feature-related research.

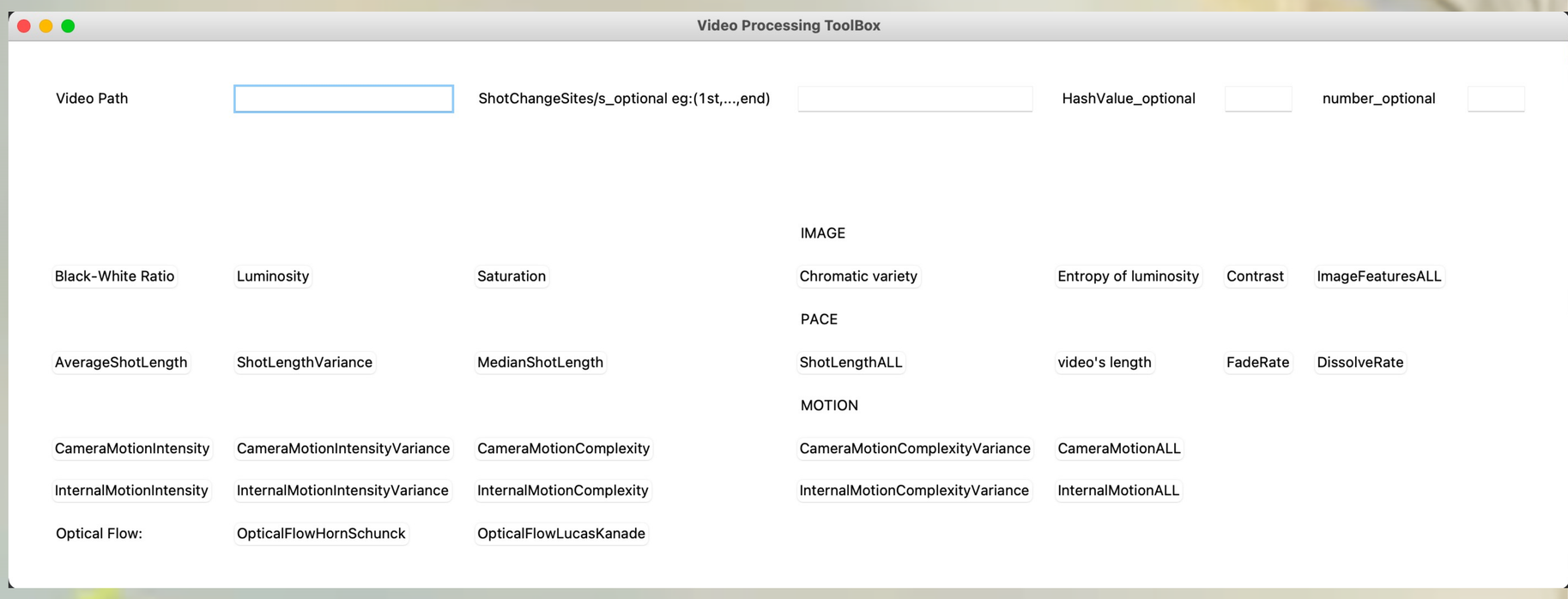

Figure 1. Graphic user interphase screenshot

Toolbox Description

Target users of this toolbox are neuroscientists who use videos as experimental stimuli, along with others who want to extract feature information from videos. To use this toolbox, users need to insert the Video Path. It's optional to insert shot changing sites, hash value, and the number of colors for "Chromatic variety", "Entropy of luminosity", and "Image Feature-All" functions' usages. Then, users may select and click at any bottom to obtain its numerical value or constructed video.

Input Video Path → Optional Inputs → Click any functions ↔ Obtain Results

Toolbox Functions	Descriptions
Black-White Ratio	proportion filmed in black and white
Luminosity	brightness of RGB spaces
Saturation	mean value of S space from HSV spaces
Chromatic Variety	various colors' composition
Entropy of Luminosity	Amount of information contained
Contrast	Sharpness of adjacent pixels
Image Features-ALL	returns results of above six descriptors
Average Shot Length	detected shot lengths' mean value
Shot Length Variance	detected shot lengths' variance
Median Shot Length	detected shot lengths' median value
Shot Length-ALL	returns results of above three descriptors
Video's Length	run time of video clip
Fade Rate	number of fade events / shot changes
Dissolve Rate	number of dissolve events / shot changes
Camera Motion Intensity	mean camera motion velocity
CMI Variance	variance of camera motion velocities
Camera Motion Complexity	camera motion orientation entropy
CMC Variance	variance of camera motion orientation entropy
Camera Motion-ALL	returns results of above four descriptors
Internal Motion Intensity	mean internal motion velocity
IMI Variance	variance of internal motion velocities
Internal Motion Complexity	internal motion orientation entropy
IMC Variance	variance of internal motion orientation entropy
Internal Motion-ALL	return results of above four descriptors
Optical Flow Horn Schunck	return a video with optical flow vectors
Optical Flow Lucas Kanade	return a video with motion tracks vectors

Methods

This toolbox adopts the Python language and cv2 packages and is realized with distinct algorithms. Based on the standard features in the field of video processing (Álvarez et al., 2019), its functions include six image descriptors, fast and accurate shot changing detection based five pace descriptors, two approaches of optical flow visualizations, four camera motion descriptors, and four internal motion descriptors.

Results / Demo

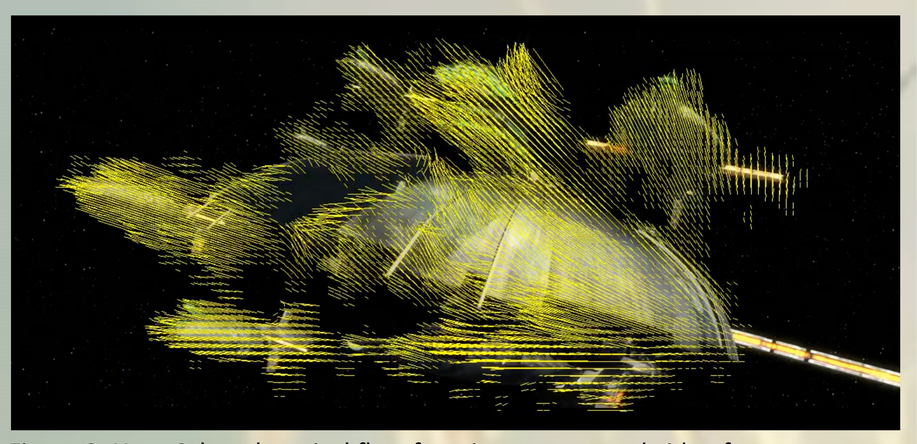

Figure 2. Horn Schunck optical flow function constructed video frame

Figure 3. Lucas Kanade optical flow function constructed video frame

Outlook

- GitHub opensource version
- Richer functions, faster processing speed
- Publication on academic journal

Reference

Álvarez, F., Sánchez, F., Hernández-Peñaloza, G., Jiménez, D., Menéndez, J. M., & Cisneros, G. (2019). On the influence of low-level visual features in Film classification. *PLOS ONE*, *14*(2). https://doi.org/10.1371/journal.pone.0211406