Bio Image Operation (BIO) user manual

Introduction

BIO is a next generation image processing tool focusing on biological applications, balancing ease of use with desired flexibility required for research. This tool has been developed in collaboration with biologists, using extensive captured images. The solution balancing both the need for research purposes and flexibility required for this, and desired ease of use is realised in a script-based user interface. The tool uses the widely used OpenCV for many of its image operations, with an efficient tracking algorithm allowing real time processing.

Requirements

- OS: Windows 64-bit (possible to compile for MacOS, Linux, Raspberry Pi)

Installation

- Download and run binary which will guide the installation process
- Clone and build from source

See Help & Links below for links to binaries and source.

Quick start

BIO is operated using a scripting interface. Script files can be loaded and saved in the user interface.

BIO can also be executed from the command line like: BioImageOperation /path/to/script.bioscript

See Help & Links below for links to example scripts.

The starting operations for source images are:

- CreateImage   -   Create a blank image
- OpenImage   -   Open a single or series of images (any ffmpeg format)
- OpenVideo   -   Open a single or series of video files (any ffmpeg video format)
- OpenCapture   -   Open capturing from video (IP) path or camera source (#)

Series of images or videos should be labelled with a numeric format, wild-card pattern can be used (i.e. OpenImage("image*.tif") will read for example image0000.tif, image0001.tif, etc.)

General rules:

- Operations have an optional assignment e.g.: a = Grayscale()
- Any operation is on the current image, unless a source image label is used
- Any operation will replace the current image, unless an assignment is used
- A line can only support one operation (with an optional assignment)
- Use // for comments
- Preceding an operation with a number (x:Operation()) will only execute the operation once every x images
- Preceding an operation with 2 numbers (x-y:Operation()) will only execute the operation once every x images, on offset y

Simple example script:

```
OpenVideo("ants_in_concrete.mov")          - open video file
{                                          - start of inner operations (for OpenVideo images)
  Grayscale()                              - convert to grayscale
  5:background = UpdateBackground(Weight=0.05)  - once every 5 images: update background using
                                             weighting & assign result to 'background'

  DifferenceAbs(background)                - subtract background from current image
  Threshold()                              - apply binary threshold on current image

  CreateClusters()                         - create clusters, automatically define parameters
  CreateTracks()                           - create tracking, automatically define parameters

  Color()                                  - convert binary image to color
  DrawTracks()                             - draw tracking into current image
  ShowImage()                              - show current image
}                                          - end of inner operations (for OpenVideo images)
```

Help & Links

- Script help in BioImageOperationScript document or command line: BioImageOperation -help
- Discussion & Support at the community forum at image.sc using the tag BioImageOperation
- Source code and script examples: github.com/folterj/BioImageOperation
- Binaries and version history: joostdefolter.info
- Qt: qt.io
- OpenCV: opencv.org
- Openh264: github.com/cisco/openh264