Methodology

# Installation

## Required Hardware

* 64-bit Modern operating system (Windows, MacOS, Linux)

## Required Software

* Python 3.6.3
* matplotlib 3.1.0
* numpy 1.17.0
* opencv-python 3.4.4.19
* Pillow 6.1.0
* XlsxWriter 1.1.8
* xlwt 1.3.0
* wxPython 4.0.7.post2

## Setup

Install all required software and place the files in a directory which containing both a “Data” and a “Images” folder with the included settings.txt file. A requirements file has been included which can be used to install all required software using the “pip install -r requirements.txt” command in the terminal.

The requirements file is used with pip, which is a terminal application to install dependencies for the program.  The program is then run from the terminal using the command “python ImagePointsBased.py.”  The terminal command “pip install -r requirements.txt” while you are in the same directory as the requirements file would then install all the required software. If you have both python 2 and 3 installed, you will need to use the command pip3 and python3 instead of pip and python in the following commands.

1.    navigate to the directory in the terminal that you have moved the programs files to.

2.    run the command “pip install -r requirements.txt”

3.    run the command “python ImagePointsBased.py”

For example, if the folder is on your desktop you would have to run the following commands in the terminal:

1. cd Desktop/Foldername
2. pip install -r requirements.txt
3. python ImagePointsBased.py

## Settings File

The settings file contains al settings for the operation of the program, the settings are listed in the order they appear from left to right.

* Starting image number
* Ending image number
* Image set number (starts at zero)
* White value threshold
* Minimum gap value (negative)
* Maximum gap value (negative)
* Minimum pixel gap value
* Storage type (1 = xls, 2 = xlsx, 3 = csv)
* Heatmap setting (A for automatic else provide a number to compare sets of heatmaps)
* Smoothing line (S = smoothing line, N = turn off smoothing line)

# Procedures

To run the program with a user interface press “Program” or “Program” for lumpfish and zebrafish respectfully. To run the terminal program, place the data folder into the data directory, adjust all necessary setting then call “python ImagePointsBased.py” or “python ZPointsBased.py” in your terminal. When the program has finished running it will automatically save its results, images and heatmap within their respective directories. Images will be saved in the “Images” folder, with the results and heatmap saved in the working directory. Similarly, when the smoothing line feature is activated, it will save the images in the “SmoothingLine” folder.