

ApisVM Script User Manual

1. Introduction

The **ApisVM** script is designed for analyzing bee wings according to the DAWINO methodology. This manual will guide you step-by-step on how to use the script for analyzing the front (Frontwing) and back (Backwing) wings, including calibration, saving results, and performing analyses.

2. Requirements

- Python 3.x
- Libraries: customtkinter, tkinter, matplotlib, pandas, cv2, numpy, xlwings, openpyxl, scipy

3. Installation

Before using the script, you need to install all the required libraries. You can do this using the following command:

```
pip install customtkinter matplotlib pandas opencv-python numpy xlwings openpyxl scipy
```

4. Running the Application

Run the script with the command:

```
python ApisVM.py
```

5. User Interface

After running the script, a graphical user interface (GUI) will open with the following options:

Sidebar

- **Frontwing:** For analyzing the front wing.
- **Backwing:** For analyzing the back wing.
- **Excel:** For merging Excel files and calculating probabilities.
- **XY points:** For displaying point coordinates.

Main Content

- **Calibration:** Set calibration based on the selected image.
- **Save:** Set the path for saving results.
- **Analysis:** Start the wing analysis.
- **Recalibrate:** Reset the calibration.
- **Reset Save:** Reset the save path.

6. Analysis Procedure

1. Calibration

1. Click the **Calibration** button.
2. Select an image of the wing for calibration.
3. Double-click to mark two points on the image to calculate the scale.
4. After successful calibration, a message will appear indicating successful calibration.

2. Setting the Save Path

7. Click the **Save** button.
8. Select the directory where the analysis results will be saved.
9. After successfully setting the path, a message will appear indicating successful save.

3. Wing Analysis

1. Click the **Frontwing analysis** or **Backwing analysis** button depending on which wing you want to analyze.
2. Select an image of the wing for analysis.
3. Double-click to mark points on the image according to the DAWINO methodology.
4. The script will calculate distances, angles, and other parameters and save the results to an Excel file.

4. Merging Excel Files

1. Click the **Excel** button.
2. Select the **Front excel merger** or **Back excel merger** option.
3. Select the Excel files you want to merge.
4. The script will create a new Excel file with average and median values.

5. Calculating Probabilities

1. Click the **Excel** button.
2. Select the **Posterior probability (Frontwing)** or **Posterior probability (Backwing)** option.
3. Select the Excel file with the analysis results.
4. The script will calculate and display posterior probabilities for various standards.