VisionTools (1.0) User Guide

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1 Introduction

Computer Vision, often abbreviated as CV, is the field of Artificial Intelligence that seeks to develop techniques to help computers see and understand the contents of digital images such as photographs and videos. In other words Computer Vision aims at giving computers a visual understanding of the world.

The problem of computer vision appears simple because it is trivially solved by people, even very young children. Nevertheless, it largely remains an unsolved problem based both on the limited understanding of biological vision and because of the complexity of vision perception in a dynamic and nearly infinitely varying physical world.

To perform Computer Vision Techniques one should undergo a series of pre-processing techniques, filtering, colour mapping feature extraction, etc. This project is aimed to create an Computer Vision Tool Box to perform a series of pre-processing techniques using popular Computer Vision Library - OpenCV. The Tool Box is a .deb executable file which can run on all Ubuntu systems without installation of additional libraries.

2 Setting Up VisionTools for the first time:

2.1 Download

Download the Setup file for Ubuntu (.deb) from the link below.

```
https://drive.google.com/open?id=1JYO_QlmCw3iEDfYTsLdH9nEZSIfxJvge
```

2.2 Installation

You can Install it to your Computer with Ubuntu Operating System using Ubuntu Software just by double-clicking on **VisionTools.deb** file as shown in the Figure 1.

Alternately you can Install it via terminal using the following command.

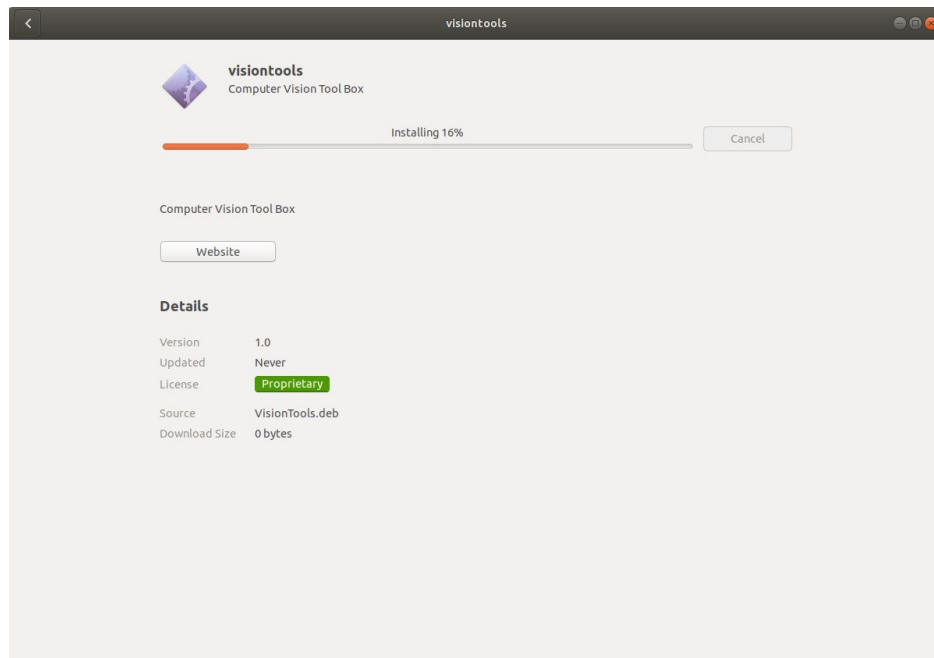*sudo dpkg -i VisionTools.deb*

Figure 1: Installation.

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3 How to Use?

To use this Tool Box pretty simple. The names given to Push Buttons closely relate to their respective tasks. Every process is guided by pop-up Message boxes which makes the GUI more user friendly. Warning Messages are shown then and there to ignore incorrect input data or parameters. In the upcoming sections you can find a detailed user guide with sample outputs.
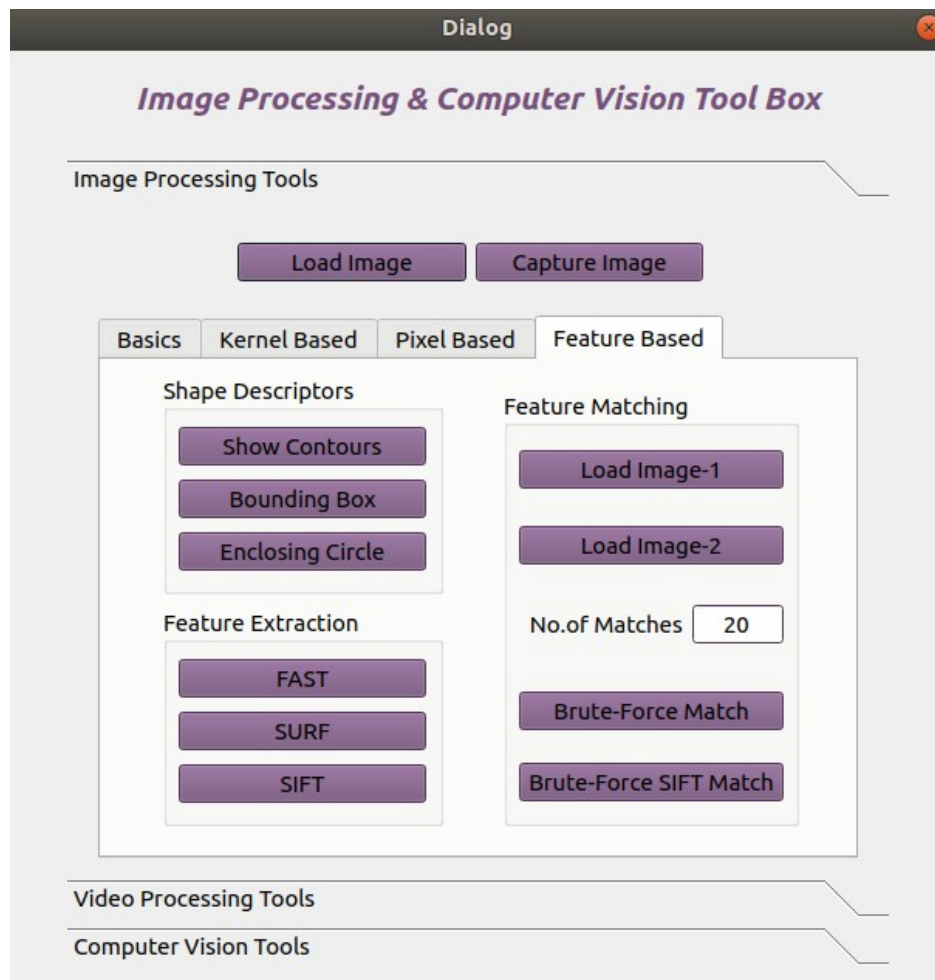

Figure 2: GUI Layout.

4 Image Processing Tools

Image Processing Tools are pretty simple to use. In most cases you will proceed with the following steps.

1. Load the Image by clicking **"Load Image"** Push Button.

2. Click the respective Process Push Button.

3. After Result is displayed a Message box pops-up asking whether or not to save the output. Click **"Save"** to save and **"Close without Saving"** to discard.

Alternately, you can Capture Image using Web-cam by clicking **"Capture Image"** Push Button and continue the rest as stated above.
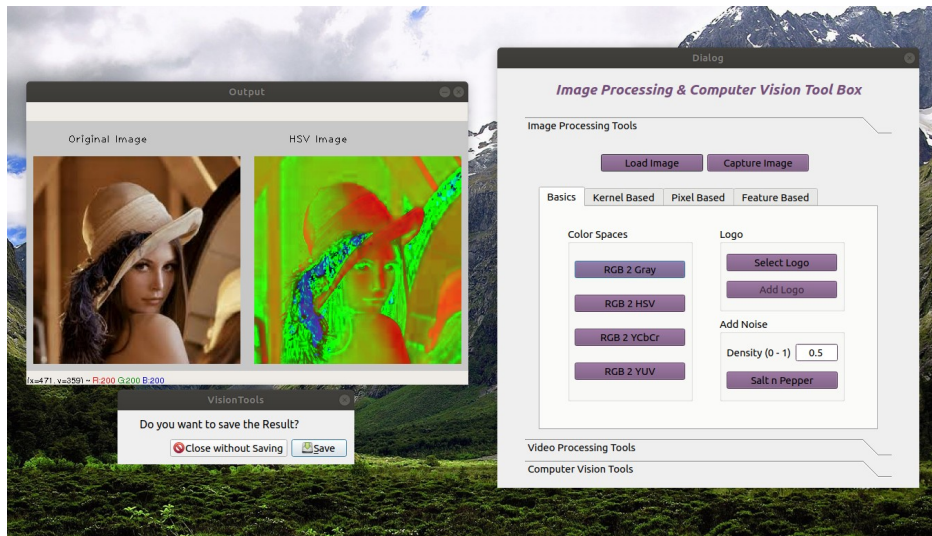

Figure 3: Image Processing Sample Output.

4.1 Add Logo

To add Logo to an Image follow these steps.

1. Select a Logo by clicking **"Select Logo"** Push Button.

2. Click **"Add Logo"** Push Button. A Message box pops-up showing the instruction to select ROI. Press **"Ok"**

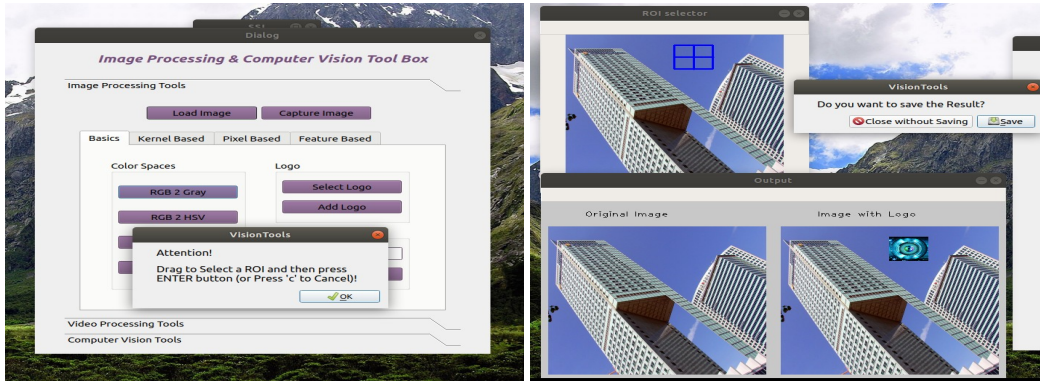3. An Image window pops-up to select ROI. Once Region is Selected the output is shown.

Figure 4: Add Logo to Image.

4.2   Kernel, Pixel, Feature Based

Most of these functions follows the same Pattern as explained in 4 expect the the need for Input Parameters which you can play with.

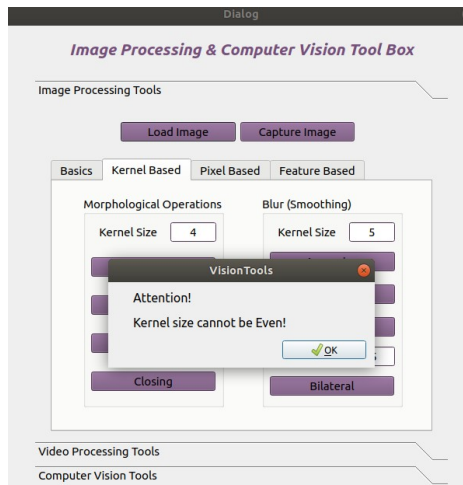Warning messages will be shown for incorrect input parameter selection.

Figure 5: Warning Messages.

4.3   Feature Matching

Feature Matching is indeed simple. Load two images and click **"Brute-Force Match"** or **"Brute-Force SIFT Match"**.

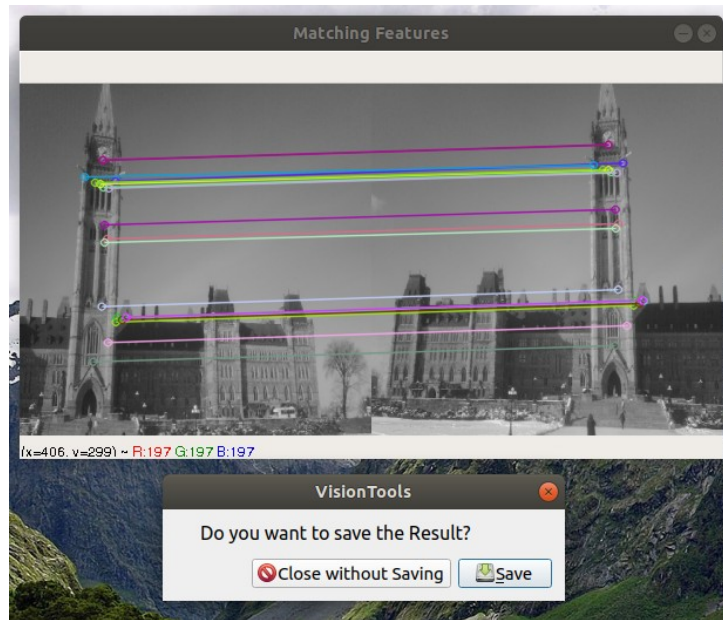For Brute-Force Match you can define the number of matches to find.

Figure 6: Feature Matching.

5   Video Processing Tools

Video Processing is even more simple. The steps are as follows.

1. Click the Process Push Button of your choice.

2. A message pops-up asking if you want to save video after capturing.

3. For saving give a valid filename *(.avi)* and then the streaming starts. Press **'s'** from the Keyboard to quit capturing and to save.

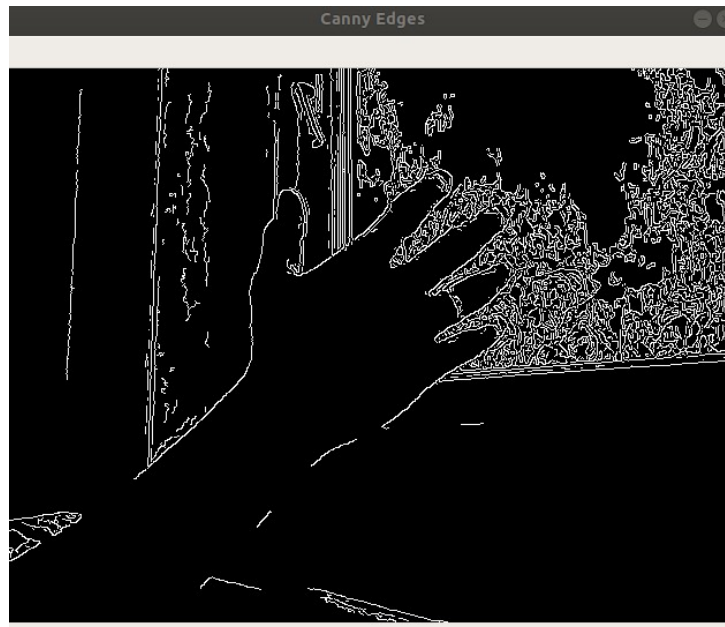4. For streaming without saving press **'q'** to quit capturing.

Figure 7: Video Processing.

6 Computer Vision Tools

You can use this App eminently for Computer Vision Tasks. The steps involved are as follows.

6.1 Calibration

1. Load a Folder containing the Calibration Patterns.

2. Click **"Calibrate"**. When Calibartion is done the Camera Matrix is displayed in the GUI.

3. Select an Image from the Calibration Patterns and Click **"Undistort"** to get the Undistorted Image.

For Capturing Image with web-cam,Click **"Capture Images"**, A message box pops-up showing "How to Capture" instructions. Follow those instruction.
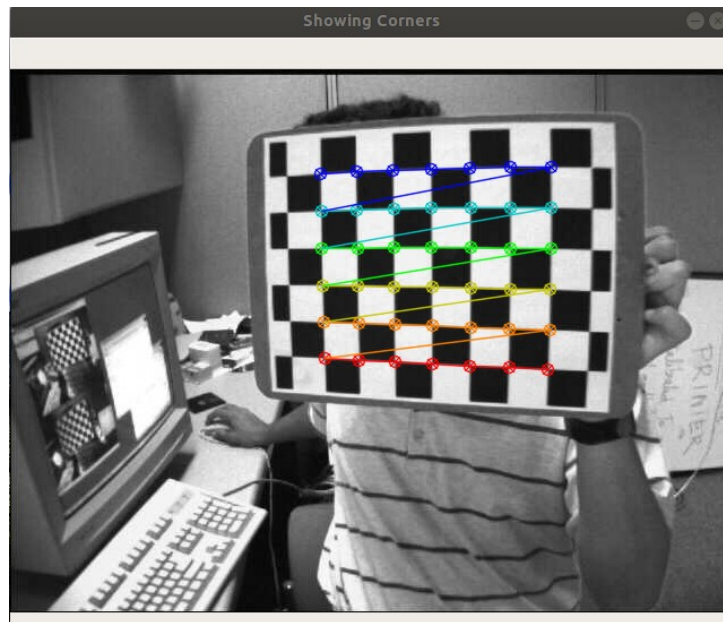

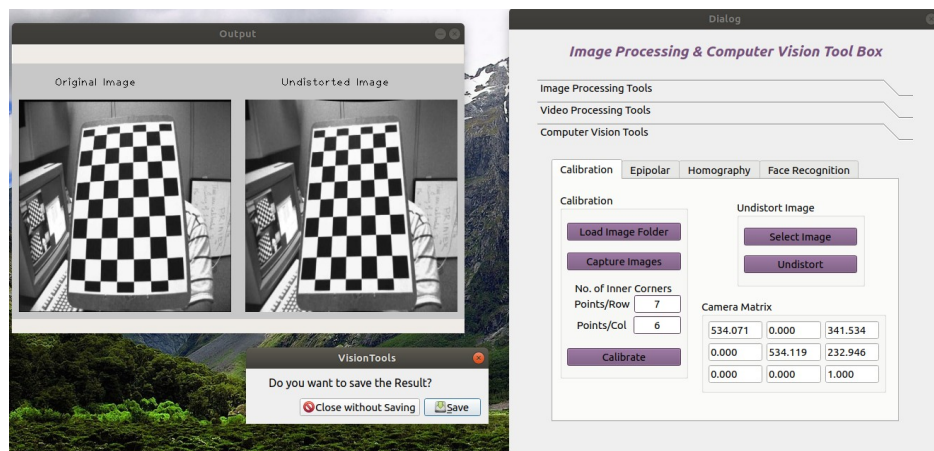Figure 8: Showing Corners in Calibration Pattern.

Figure 9: Calibration & Undistort Results.

6.2 Fundamental Matrix and Epipolar

1. Load two images (or) Capture two images.

2. Select the Algorithm you want to use.

3. Click **"Compute FM"**. Fundamental Matrix will be displayed in the GUI.

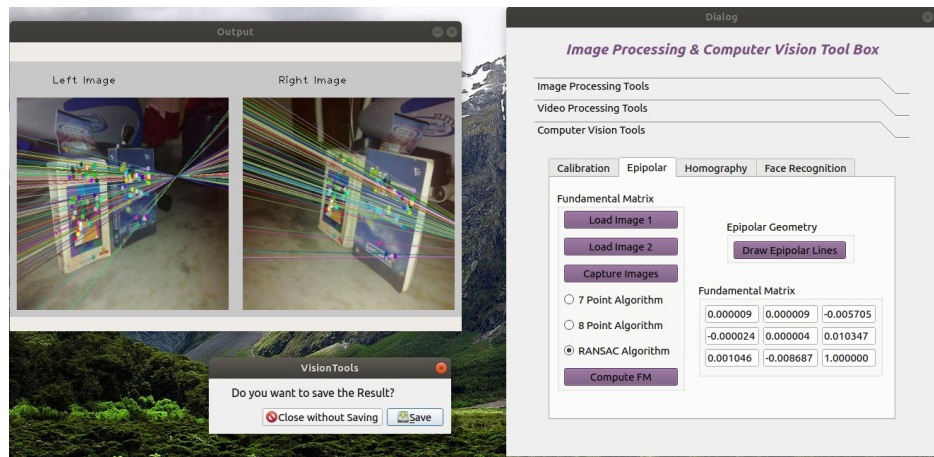4. Click **"Draw Epipolar Lines"** to draw epipolar lines in the selected Images.

Figure 10: Fundamental Matrix & Epipolar Lines

6.3   Homography and Mosaicing

1. Load two images (or) Capture two images.

2. Click **"Compute Homography"**. Homography Matrix will be displayed in the GUI.

3. Click **"Mosaic Images"** to add two images with found Homography.
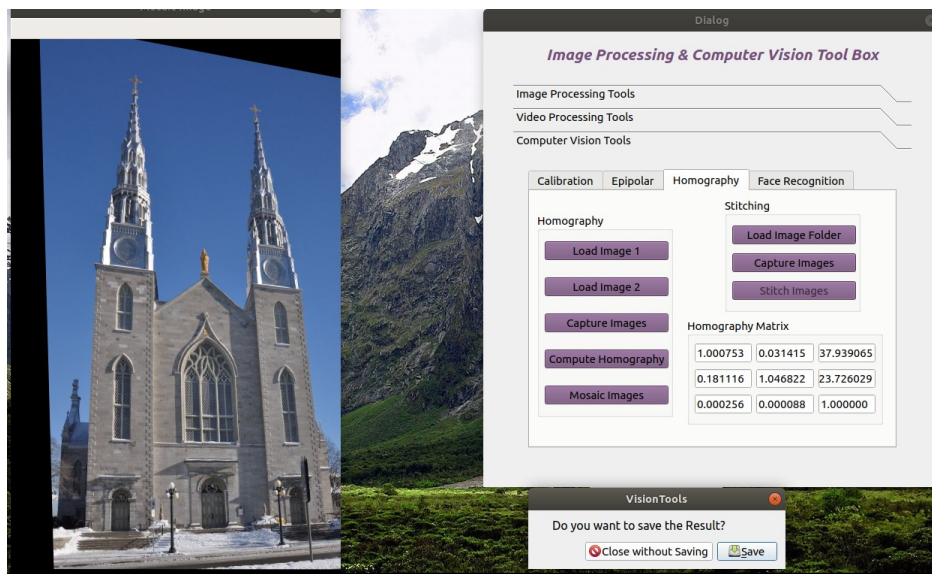

Figure 11: Homography & Mosaic.

6.4   Stitching

1. Load a Folder containing the panaromic images to stitch.

2. Click **"Stitch Images"** to get the Stitched Image. ***Note:*** *Stitching takes some time to show the output.*

For Capturing Image with web-cam,Click **"Capture Images"**, A message box pops-up showing "How to Capture" instructions. Follow those instruction.

Figure 12: Image Stitching.

6.5 Face Recognition

6.5.1 Face Detection

1. Load Face Pre-trained Classifier (.xml) of your choice.

2. Load Eye Pre-trained Classifier (.xml) of your choice.

3. Select an Image (or) Capture an Image.

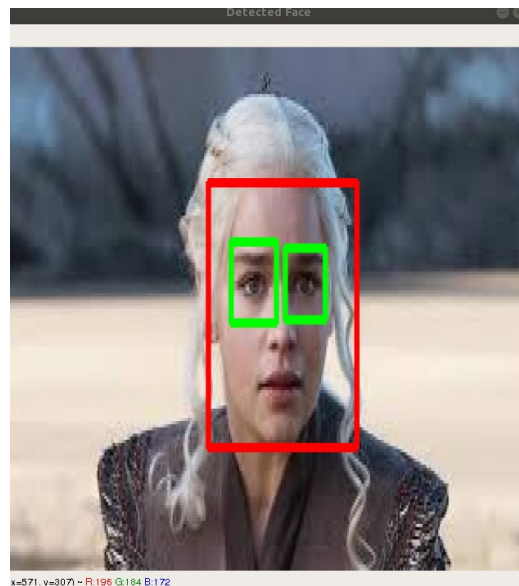4. Click **"Detect Face"**. The output looks like the figure.

Figure 13: Face Detection.

6.5.2 Recognition

1. Load the directory containing folders with images (one folder per subject). Make sure the folder names should be numbers.

2. Load train label as a .txt file which contains names of the subjects present in training data. A sample is shown in figure .

3. Select a Recognizer of your choice and click **"Train Recognizer"** to train.

4. Once training is done, Select an image and Click "Recognize", the output looks like the figure

Figure 14: Face Recognition.