

International Institute of Information Technology, Hyderabad
CS7.505: Computer Vision
Assignment 0: OpenCV and Chroma Keying

Instructions:

- The goal of the assignment is to introduce you to several computer vision tasks and the use of OpenCV package.
- You need to upload a single pdf file containing 1) your report 2) your code that you wrote and 3) its output images. The file should be uploaded in the moodle portal.
- Include the assignment number, your name and roll number at the top-right of the first page of your submission (pdf).
- **Make sure that the assignment that you submit is your own work. Any breach of this rule could result in serious actions including an F grade in the course.**
- The experiments and report writing takes time. Start your work early and do not wait till the deadline.

Submission: Any time before *Tuesday, 16 Jan 2024, 11:00PM*

1 Installing OpenCV

The first step of doing this assignment is to install the OpenCV package on your computer. OpenCV is an open source library for developing computer vision applications. Please see: <http://opencv.org> for details of both installation and usage of the library. OpenCV has Linux, Windows and Mac versions available. Note that the compilation of the library from the sources would take a few hours. Make sure you installed the required libraries before compiling and installing OpenCV. Test your installation with a basic program to read write and modify an image. In linux, opencv is readily available through the built in software installation utilities.

The primary goal of the assignment is the learning you get from writing the code and experimenting with various factors. So do write a detailed account of the various experiments and your learnings in your report.

For this assignment, you are expected to write C/C++ or Python code for the tasks described in Section 2.

2 Chroma Keying with OpenCV

1. Video ↔ Images: Write a program to convert a given video to its constituent images. Your output should be in a specified folder. Write another program that will merge a set of images in a folder into a single video. You should be able to control the frame rate in the video that is created.
2. Capturing Images: Learn how to capture frames from a webcam connected to your computer and save them as images in a folder. You may use either the built-in camera of your laptop or an external one connected through USB. You should also be able to display the frames (the video) on the screen while capturing.
3. Chroma Keying: Read about the technique of chroma keying. Following are a few good starting points:
 - Introduction: http://en.wikipedia.org/wiki/Chroma_key
 - Alvy Ray Smith and James F Blinn, "Blue Screen Matting", SIGGRAPH'96.

Create an interesting composite of two videos using this technique, possibly with one video including yourselves.

2.1 Additional Problems

You may also try the following problems if you are interested. You need not submit them as part of this assignment.

1. Shot detection: Given a video, convert it into its constituent shots. A shot is sequence of frames in a video that are captured together (between two cuts). Write a function that would split a given video into smaller videos, each containing a single shot.
2. Face Detection: OpenCV contains a built-in face detector that will find the locations of faces in a given image. Your code should use this to find all faces in all the images in a directory. The output should contain a text file that give the locations (bounding boxes) of each face in each of the images. The faces in each image should also be marked with boxes around them. Note that you can combine this with the program in task 1 to do face detection in videos. Finally, consider a set of images where the number of faces is known and plot an ROC curve by varying the detection threshold. The FDDB dataset provides a set of images with known face locations: <http://vis-www.cs.umass.edu/fddb/>

3 Submission

Submit a report as a single pdf file as mentioned at the top. As described before, include your name and roll number at the top of the first page of this pdf. Submit the file in the moodle portal before the deadline (11PM on Monday, 17th January). The report should contain three parts corresponding to each of the steps in Section 2, each part contains the following:

- A description of the problem, solution, and experiments you performed.
- Challenges you faces and learnings from the experiments.
- Sample results (images).
- Code if any (primarily for Chroma Keying).

You are expected to write the complete code for the assignment yourselves. **DO NOT COPY ANY PART FROM ANY SOURCE** including your friends, seniors or the internet.