

Getting Started

Session 1

Computer Vision Group
IIT Madras

November 1, 2014

1 Installation OpenCV

- Windows
- Ubuntu

2 Concepts in Image Processing

- Pixels
- Image Processing
- Image Transformation

3 Feature Extraction

- What are features?
- Why we need feature extraction?
- Some feature extraction tools

Installing OpenCV

Windows 7/8

- Install Anaconda 2.0.1
- Download OpenCV 2.4.9 and extract to a convenient location
- Go to opencv/build/python/2.7 folder
- Copy cv2.pyd to INSTALL_DIRECTORY/Python/lib/site-packages
- Open IPython QT console.
- `import cv2`

If you don't get any errors, its a success.

Installing OpenCV

Ubuntu

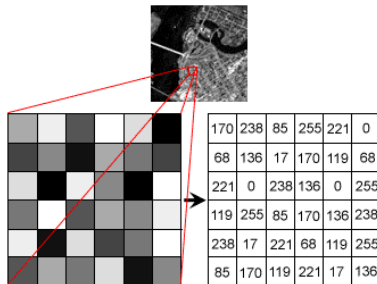
Using the apt-get tool

```
# sudo apt-get install python-opencv
```

Installs an older version of OpenCV. Build from source to get the latest version.

Pixels

Recap



- Basic building blocks of an image
- Color represented as a tuple (R, G, B)

Image Processing

Recap

- Thresholding
- Erosion
- Dilation

Thresholding

Image Processing



Erosion

Image Processing

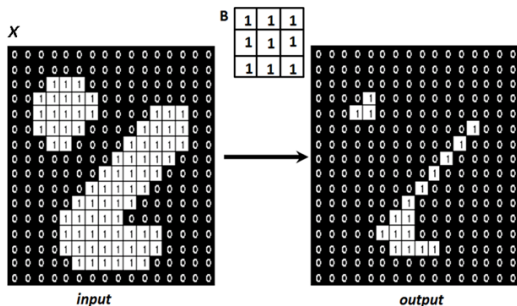


Figure 2. Effect of *erosion* using a 3X3 square structural element B.

Image Processing



Image Transformation

Fairly Simple

- Rotation
- Translation
- Cropping
- Warping

Rotation

Image Transformation



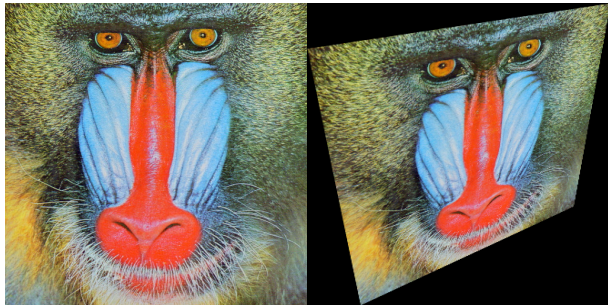
Translation

Image Transformation



Warping

Image Transformation



Feature Extraction

What are features?

Feature Extraction in Images

Transforming rich content of images into a set of values. Feature extraction is a crucial part in Machine Learning.

Feature Extraction

What are features?

Feature Extraction in Images

Transforming rich content of images into a set of values. Feature extraction is a crucial part in Machine Learning.

Example

Histograms are commonly used for extracting set of features. More feature extraction techniques coming up.

Feature Extraction

What are features?

Feature Extraction in Images

Transforming rich content of images into a set of values. Feature extraction is a crucial part in Machine Learning.

Example

Histograms are commonly used for extracting set of features. More feature extraction techniques coming up.

Digit Recognizer

We'll be using Machine Learning to build a digit recognizer in tomorrow's session.

Feature Extraction

Why we need features?

Lets say you are in an unkown country. To know about the country, you can see each and every house in it, and using the reference information about all houses (location and shape) in every country, you can find which country you are in. That sounds bad, lets take a helicopter and fly. What you can see now are not houses, but streets filled with houses. You now have a feature set of smaller size (All street names in the country) which can be looked up easier. Even that can be difficult, so you can fly further up and now you see cities, which should make the task fairly easy. It is the same case with feature extraction. You look at the dataset from a higher abstraction, extract relevant features (like City names) and train your machine. The catch here is you cannot fly so high that you see the country as a whole to directly find what it is. Using whatever abstraction possible (looking from a helicopter), you try to learn higher levels of abstraction (looking from a space shuttle). So, why are there so many techniques for extracting features? Instead of looking at cities, a completely different way would be to look at mountains and rivers to identify the country. We need

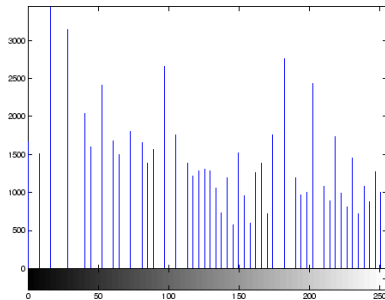
Feature Extraction Tools

There are many more available

- ① Binarized pixel values
- ② Intensity histogram
- ③ Histogram of Oriented gradients
- ④ SIFT

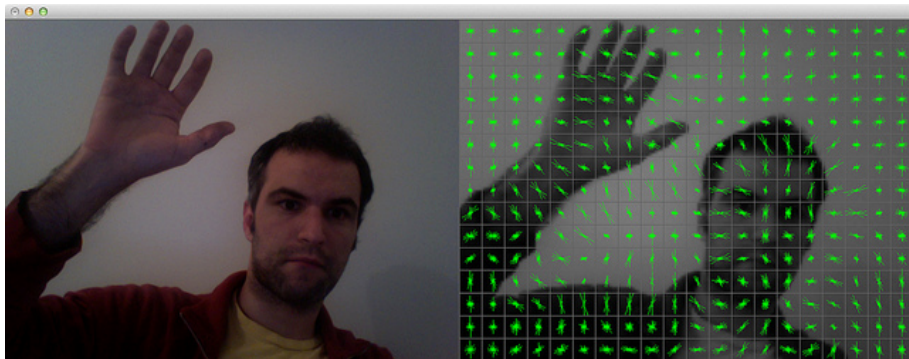
Intensity Histogram

Feature Extraction



Histogram of Oriented Gradients

Feature Extraction



Summary

Today's session

- Image processing/transformations
- Feature Extraction

Tomorrow's session

- Machine Learning Basics
- Training a classifier for handwritten digit recognition