Image Processing & Android

Mohammed El-Agha

Outline

- Definition
- Mat
- Color Normalization
- Used in
- OpenCV
- How to, In Android?
- Android Example - Face Detection

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- **Definition**
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Definition

- Digital Image Processing is computerized method of converting image to digital format, to be able to processed as normal type of data.

- Analog Image Processing is old type of image processing which convert image to two-dimensional analog wave, then perform actions on the image by change some details in analog wave values.

Definition

- In general, there are 5 classes of **Purposes of Image Processing**, that are:

1. Classification
   - dividing entities in the image into categories
2. Feature Extraction
   - extraction of useful information from image
3. Signal Processing
   - analysis and modifying signals (or digital data) in the image
4. Pattern Recognition
   - recognition of patterns and regularities in image
5. Graphical Projection
   - viewing three-dimensional on onto a planar surface

Definition

- Computer Vision is Science that combines between Image Processing and Machine Learning, to enable computer to gain high-level understanding from digital images or videos.

Definition

- In general, any image processing must be performed in

1. Read image
2. Matting
3. Color normalization
4. Processing
5. Write image

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Mat

- All programming languages use “Mat” as the name of class which contains the image.
- Mat is digital array that represents the container of image.
- First step of image processing is convert image file to Mat, because the processes will be executed on Mat; not file.

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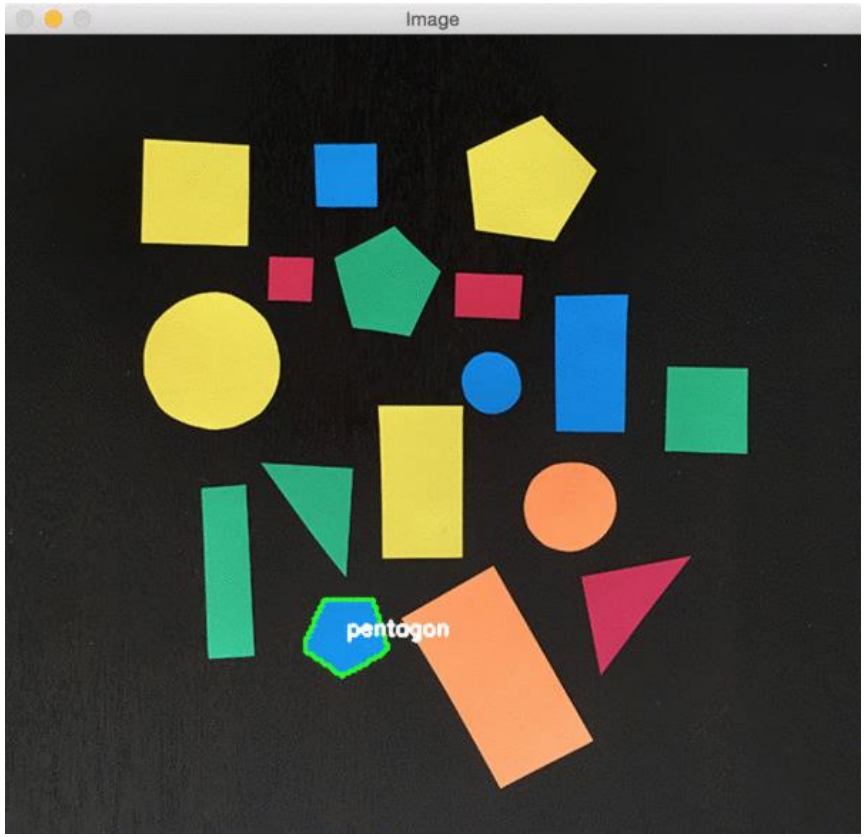
Color Normalization

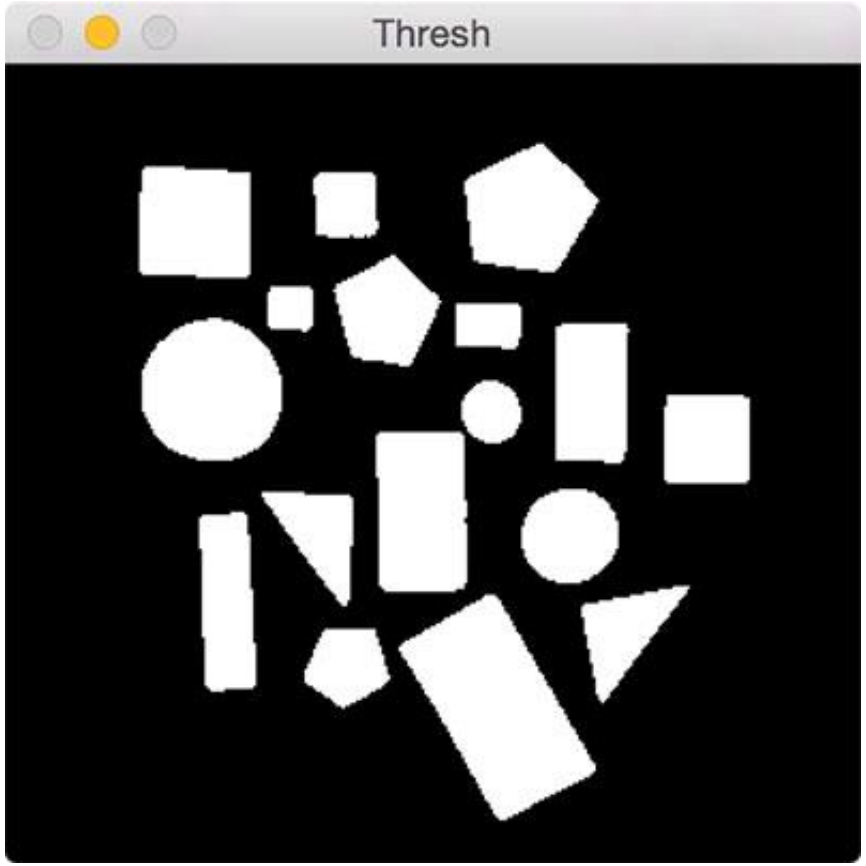
- Color Normalization is the most common process in image processing, because it is pre-processing (or preparation) of image to be ready to main image processing.

- Color Normalization is unification of colors in image to specific & few colors.

Color Normalization

Color Normalization





Color Normalization

- Examples:
  - To RGB
  - To white & black (Binarization)

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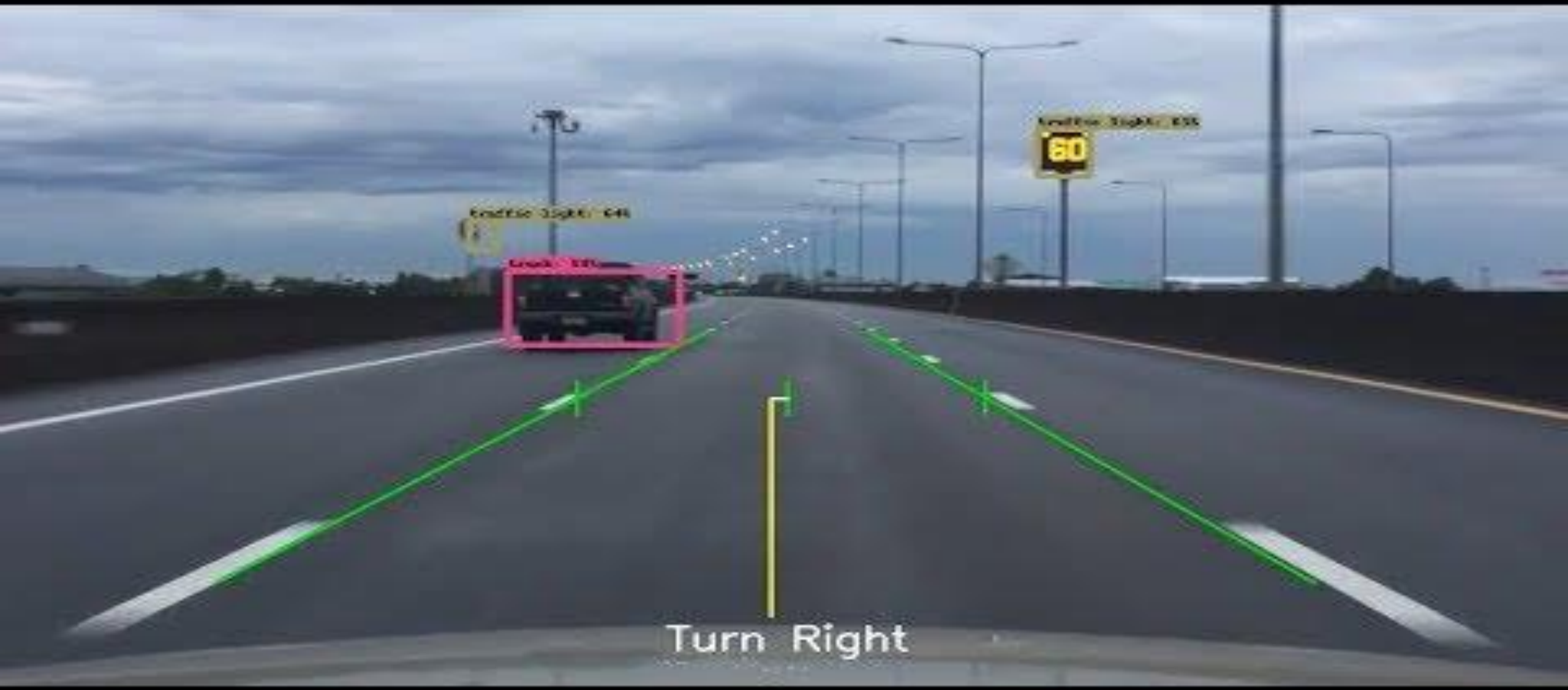
Used In

- Face Detection
- Face Recognition
- Facial Occlusion Detection
- Object Detection
- Car License Detection
- Line Detection
- Shape Detection
- Cars Detection
- Eating Detection
- Filtering
- OCR (Optical Character Recognition)
- Astronomy
- Disease Detection
- Color Detection
- X Ray Imaging
- Hurdle detection
- Video processing
- UV imaging

Used In

- Computer Vision can deals with
  - Image
  - Video
  - Real-Time Video

Used In


60
Turn Right

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OpenCV

- OpenCV is most common library for Computer Vision, with a lot of image processing tasks

- OpenCV is C++ library, with a lot of wrappers for
  - JAVA
  - Android
  - Swift
  - PHP
  - Python

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How to, In Android?

- Camera in Activity
- https://github.com/MohammedElagha/upicomp_course/tree/master/CameraWithinActivity

- Real-Time Camera
- https://github.com/MohammedElagha/upicomp_course/tree/master/RealtimeFaceDetector

How to, In Android?

- OpenCV for Android
- https://opencv.org/android/

- Download OpenCV SDK
- https://sourceforge.net/projects/opencvlibrary/files/opencv-android/

How to, In Android?

- Image Thresholding (Binarization)
- https://docs.opencv.org/master/d7/d4d/tutorial_py_thresholding.html

- Image Thresholding (Binarization) in Android - Samples
- https://www.programcreek.com/java-api-examples/?class=org.opencv.imgproc.Imgproc&method=threshold

How to, In Android?

- Color Conversions
- https://docs.opencv.org/3.4/de/d25/imgproc_color_conversions.html
- https://opencv-python-tutroals.readthedocs.io/en/latest/py_tutorials/py_imgproc/py_colorspaces/py_colorspaces.html

How to, In Android?

- Smoothing Images
- https://docs.opencv.org/master/d4/d13/tutorial_py_filtering.html
- https://github.com/araravi/testapp/blob/master/hiii/src/com/example/hiii/Smoothing.java

How to, In Android?

- Blob Detection
- https://www.learnopencv.com/blob-detection-using-opencv-python-c/
- https://github.com/opencv/opencv/tree/master/samples/android/color-blob-detection
- https://stackoverflow.com/a/40821187

How to, In Android?

- Color Detection
- https://www.informatalks.com/color-detection-using-opencv-in-android/
- https://github.com/friendoflore/OpenCv-for-Android-Color-Detection

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Android Example

- **Realtime Face Detection in Android**
- https://github.com/MohammedElagha/upicomp_course/tree/master/RealtimeFaceDetector