Homework 01, UST AIP Basic OpenCV Example

Applying Point Operation and Rotation on an Image

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Summary—This report presents the basic operations on images such as point operation (changing brightness and contrast of an image) and rotation of an image. Tools used in this project are OpenCV 3.2 Library which is a library used for Computer Vision, and Visual Studio 2015 (64 bit).

I. IMAGE OPERATIONS

In computing, all data is logically represented in binary. This is true of images as well as numbers and text. However, an important distinction needs to be made between how image data is displayed and how it is stored. Images can be simply represented by 2D array consisting of rows and columns. Different operations and techniques can be applied on images. The basic tasks which are done in this report are i) Changing Brightness ii) Changing of Contrast Value and iii) Rotation.

Images are captured having three channels which are Red, Green and Blue. Changing brightness is a point operation on each pixel. To increase the brightness, some constant value to each and every pixel need to be added and for decreasing the brightness some constant values need to be subtracted or more simply negative values must be added. To increase or decrease the brightness of an Image in openCV the scalar function is added with the original image, so for increasing the brightness positive values are assigned to the arguments of scalar function and for decreasing the brightness negatives vales are assigned. Changing the contrast is also a point operation on each pixel. The easiest way to increase the contrast of an image is, multiplying each pixel value by a number larger than 1 and for decreasing contrast multiply each pixel value by a number smaller than 1. Rotating images by a given angle is a common image processing task. OpenCV provides some built-in functions making it easy to do it. For rotation I defined a function with the name of rotate whose return value is image, and arguments are image source and angle, this function take image from the specified path, rotate that according to some mathematical operations and then returns the rotated image.

II. OPENCV SOURCE OF ALL PROGRAMS

The following source code reads an input image and then do the following tasks i) Increase the brightness ii) Decrease the brightness iii) Increase the contrast value iv) Decrease the contrast value and v) Rotate the given image.

```
Mat src = imread("man.png");

Mat imgH = img + Scalar(75, 75, 75);
//increase the brightness by 75 units
Mat imgL = img + Scalar(-75, -75, -75);
//decrease the brightness by 75 units
Mat imgH;
img.convertTo(imgH, -1, 2, 0);
//increase the contrast (double)
Mat imgL;
img.convertTo(imgL, -1, 0.5, 0);
//decrease the contrast (halve)


// Function for Rotation
Mat rotate(Mat src, double angle)
{
   Mat dst;
   Point2f pt(src.cols / 2., src.rows / 2.);
   Mat r = getRotationMatrix2D(pt, angle, 1.0);
   warpAffine(src,   dst,   r,   Size(src.cols,
src.rows));
    return dst;
}
```

III. RESULTS

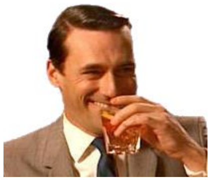
Fig. 1. Original Image

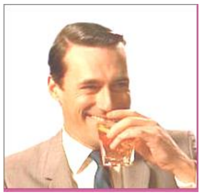
Fig. 2. High Brightness

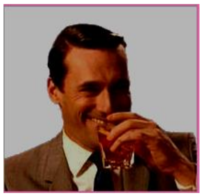
Fig. 3. Low Brightness

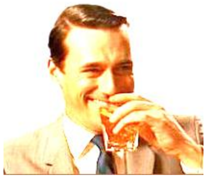
Fig. 4. High Contrast

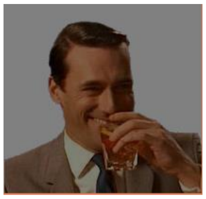
Fig. 5. Low Contrast

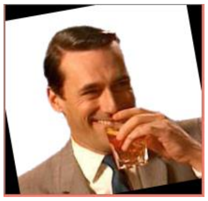
Fig. 6. Rotated Image

CONCLUSION: - OpenCV provides a lot of functions for image and video processing, in which some of the basic functions of along with the source code and implementation on images were discussed in this report.