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Research Paper

Latest advancement in image processing techniques

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Abstract

Image processing is method of performing some operations on an image, for enhancing the image or for getting some information from that image, or for some other applications is nothing but Image Processing [1]. Image processing is one sort of signal processing, where input is an image and output may be an image, characteristics of that image or some features that image [1]. Image will be taken as a two dimensional signal and signal processing techniques will be applied to that two dimensional image. Image processing is one of the growing technologies [1]. In many real time applications image processing is widely used. In the field of bio technology, computer science, in medical field, envi-ronmental areas etc., image processing is being used for mankind benefits. The following steps are the basics of image processing:

- Image is taken as an input
- Image will be processed (manipulation, analyzing the image, or as per requirement)
- Altered image will be the output

Image processing is of two types
Analog Image Processing:
As the name implies, analog image processing is applied on analog signals. Television image is best example of analog signal processing [1].
(DIP) Digital Image Processing:
DIP techniques are used on images, which are in the format of digital for processing them, and get the required output as per the application. Operations were applied on the digital images for processing [1].
In this paper, we will discuss about the technologies or tools for image processing especially by using Open CV. With the help of Open CV image processing will be very easy and efficient. When Open CV is collaborated or integrated with python the results are mind blowing. We will discuss about the process of using python and Open CV.

Keywords: *Image Processing; Digital Image Processing; Open CV; Python.*

1. Introduction

Image processing has a toolbox™ , which provides a specific set of standard algorithms and there are inbuilt apps for processing the images, analyzing the images, visualization of the images, and for the development of the algorithm. Many operations can be performed namely, noise reduction, image enhancement, image registration, geometric transformations, segmenting images, and image processing in 3D. Algorithms will be accelerated when we run them on multicourse processors and GPUs.

2. Computer vision

We humans see the world through our eyes; analyze them by using our brain. The same theory is applied to the computer for better results [3].
Computer vision uses the same technique, computer views the object or the world visually and with its capabilities we will get best results when compared to humans [3].

In computer vision we will use theoretical knowledge, algorithms and some other techniques with which we can achieve visual understanding in the better way [3].
Computer vision is nothing but the way or the process of extracting automatically from images, analyzing and understanding one image or series of images for extracting the required useful information [3].
Technology where computer or machine sees and understands is Computer Vision [4].
The applications of computer vision are as follows [3]:

- medical analysis for images
- pollution control monitoring
- controlling of process
- RS/GIS
- Robotic technology
- security and surveillance
- transportation
- recognition of characters
- forensics
- industrial quality inspection
- recognition of face

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- gesture analysis
- agriculture industry
- augmented reality
- independent vehicles
- geosciences
- restoration of images

3. Introduction to python

Python is an object oriented programming language which is integrated with JIP compiler [5].
Python is simple language, it is easy to write and read. Maintenance is easy when we use Python [5].
Python is dynamic language. In python byte code will be compiled. The source code doesn't include declaration of variables, functions, methods or parameters [6]. As the source code decreases python is a flexible language.
At the runtime, the values which are used are identifies and marked as flags; it decreases the runtime [6].
Python is an open source. We can download and directly use it. When we use Ubuntu OS, the version of python will we updated automatically.
Lot of applications can be done by using Python programming language. In many fields we can use this language.
In Image processing, we can use this language for best results. In this paper, we are using this language in relation with open CV for reading and abstracting the required information from the given input.
Images are given as the input, according to the application, we will write the code for respective output. In some cases, images are just analyzed and the output will be produced, in some cases, the integer values will be takes from the image which are required to the application, in some other cases, image is analyzed and bar charts will be produced from that image.

4. Introduction to open CV

Like Python, Open CV is also an open source.
Open Source Computer Vision Library is defined as Open CV. Open CV was started in 1999, for some programmers [7]. The main aim of the programmers is to incorporate processing of images with different types of programming languages such as C, C++, Python etc in all the types of operating systems such as windows, Linux, Android and Mac [7]. It is very easy to install and use Open CV.
Open CV library is cross platform, which mainly focuses on real time image processing.
Open CV includes many inbuilt modules [8]. Some of the, are

- Core module: for core functionality
- Imgproc module : for image processing
- Imgcodes module : for image file reading and writing
- Videoio module : for input and output media
- Highgui module: for high level graphical interface.
- Video Module : for Video analysis Calib3d module : for Camera Calibration and 3D construction
- Objdetect module : for object detection
- ML module : foe machine learning
- Photo module : for computational photography

These are some the main modules, there are many more modules which can be used for our requirements.

4.1. Basic operations in open CV

There are many operations we can use in Open CV the below some of the basic operations:
Reading images:
To read an image we use cv2.imread (), there are two arguments [8]
First Argument is as follows

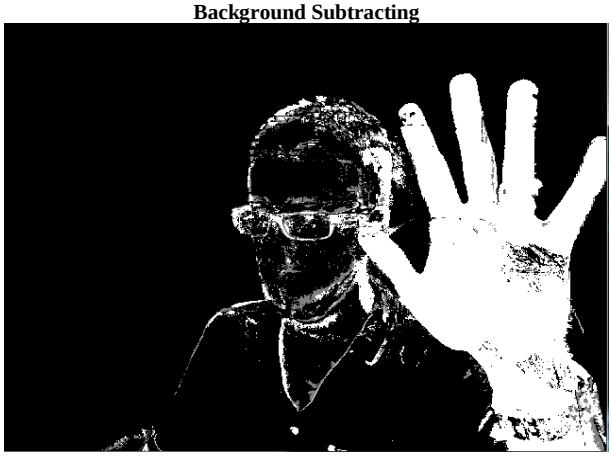
- cv2.imread () is the function used to read an image. The correct path of the corresponding image has to be given [8].
- Second argument is as follows
- cv2.IMREAD_COLOR: Color image will be loaded. It will neglect the transparency of image.[8].
- cv2.IMREAD_GRAYSCALE: image in grayscale mode [8] will be loaded.
- cv2.IMREAD_UNCHANGED: Including alpha channel [8] the image will be loaded

Displaying images:
cv2.imshow (), is the function used to display the image in a window. Image size is automatically fitted to window.
Window name and the required image are the arguments. As many windows can be created according to our interest but the names should be unique [8].
cv2.imshow ('abc', img)
cv2.waitKey (0)
cv2.destrouAllWindows ()
Writing images:
For writing images, we use cv2.imwrite () function [8].
File name and the image we want to store [8] are the arguments for this function.
Image will be saved in the format of JPEG [8].

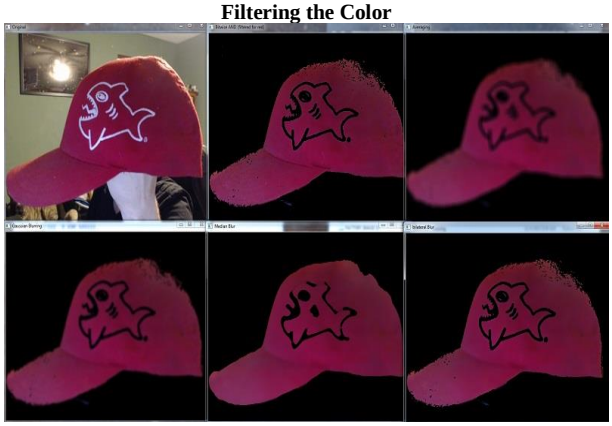
4.2. Image processing techniques (Open CV)

Open CV has many techniques for image processing.
Some of them are
Changing Color Spaces: Color spaces of the images will be changed [9].
Geometric Transformation of Images: Applying translation, rotation, reflection on the images [9].
Image thresholding: converts the images to binary images.
Global thresholding, adaptive thresholding are some of the techniques [9].
Smoothing: Operations such as blur or filter will be applied on the images [9].
Image gradients: for finding the gradients or edges of the images [9].
Edge detection: To find edges for images by using Canny edge detection [9].
Image transformation in Open CV: Fourier transformation on images is applied [9].
Histograms in Open CV: To draw 2 D and 3D histograms by using Open CV [9].
Contours in Open CV: To draw contours for images [9].
Python and Open CV
Before we start we have to bind Open CV with python, it is very easy and should be done at the beginning stage. For this we need two main libraries, Open CV – Python, Numpy and Matplotlib is optional [11].
For Windows:
Initially download wheel (.whl) file and then install it using pip.
pip install numpy
pip install matplotlib
Matplotlib:
This is one of the optional library; we will use this library for displaying frames from videos or images.
Numpy is one of the libraries in python. It is used for many purposes, for numbers and for others. Numpy is the best feature to use when we are working with open CV and python.
When we are installing we have to install Open CV completely. Some operations will not be executed when we have not installed completely but some operations we execute a bit. So installation should be complete and proper.
We have to make sure that installation is complete. For that purpose we have to check by running the following instructions:
Import library1
Import matplotlit
Import library2
If there are no errors, we can start doing the work.
Some of the examples are as follows:

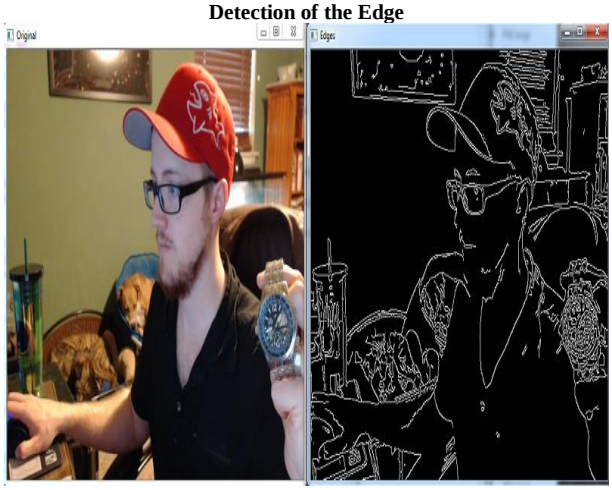
Background Subtracting



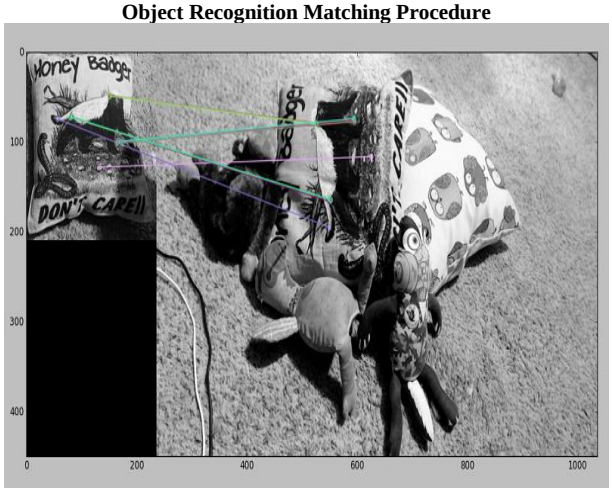
Filtering the Color



Detection of the Edge



Object Recognition Matching Procedure



Object Recognition in General




```
import cv2
import numpy as nup
from matplotlib import pyplot as pot
img = cv2.imread('watch_1.jpg',cv2.IMREAD_GRAYSCALE)
cv2.imshow('image',img)
cv2.waitKey(0)
cv2.destroyAllWindows()
```

As mentioned before, you can also display images with Matplotlib, here's some code for how you might do that:

```
import cv2
import numpy as nup
from matplotlib import pyplot as pot
img = cv2.imread('watch_1.jpg',cv2.IMREAD_GRAYSCALE)
pot.imshow(img,cmap='gray', interpolation ='bicubic')
pot.xticks([]),pot.yticks([])
pot.plot( [500,600,700,800], [300.400.500], 'c'. linewidth=8
pot.show()
```

Lines can be plotted by using Matplotlib, in this case pixels are taken as coordinates. If we want to draw lines on the images Matplotlib is not necessary. Open CV have inbuilt methods for this purpose. When you are done making modifications, you can save, like so:

```
cv2.imwrite('watchgray.png',img)
```

5. Conclusion

Image processing is used in many applications. It is wide spread in all the areas of sciences and technology and even in medicine. By using Open CV we can get best results. If we add python to Open CV miracles will happen for getting accurate and appropriate results. We can apply inbuilt algorithms or functions; according to the application if it needs we can write our own code for the application we are working. Finally, I conclude that we can use latest technologies for getting results faster and accurate.

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