

Using Open CV for Machine Learning in Real Time Computer Vision and Image Processing

S Pradeep, Yogesh Kumar Sharma

Abstract: *Computer Vision and Digital Image Processing is one of the emerging domain now days in different applications including Face Recognition, Biometric Validations, Internet of Things (IoT), Criminal Investigation, Signature Patterns Detection in Banking, Digital Documents Analysis, Smart Tags based Vehicles for recognition at Toll Plaza and many others. All these applications use image and real time video processing so that the live capturing of multimedia impression can be capture for detailed analysis and predictions. This paper underlines the use of OpenCV as the effective framework for the assorted application domains with the specific scenarios associated with the image forensics. In addition, the manuscript is presenting the cavernous view of the OpenCV to identify the deep images with the analytics patterns for the predictions in the hidden patterns.*

Index Terms: *Computer Vision, Deep Learning, Machine Learning, OpenCV*

I. INTRODUCTION

Computer Vision [1] is widely integrated in different applications including 2D and 3D image analytics, Ego motion estimation, feature points detection, Human-computer interaction (HCI), Facial recognition system, Mobile robotics, Gesture recognition, Object identification, Segmentation Recognition, Motion understanding, Stereopsis Stereo vision, Motion tracking, Structure from motion (SFM), pattern recognition, Augmented reality, decision making scene reconstruction, and many others [2, 3].

Current Research Areas and Challenges in Computer Vision:

A number of research areas and challenges are associated with computer vision whereby enormous algorithms and approaches are devised so far with the evaluation factors of the algorithms [4]. Following are the key research areas in computer vision and image analytics that are in process by the practitioners and scientist in this research segment

- Deep Neural Network for Biometric Evaluation
- Facial Sentiment Analysis and Emotions Recognition
- Real Time Video Analysis and Recognition of Key Features
- Gesture Recognition

- Visual Representation Learning
- Face Smile Detection
- Vein Investigation and Training for Biometrics
- Multi-Resolution Approaches
- Radiomics Analytics for Medical Datasets
- Forgery Detection in Digital Images
- Content Based Image Retrieval
- Automatic Enhancement of Image
- Identification and Classification of Real Time Objects
- Defects Prediction in Manufacturing Line using Live Image of Machine
- Industrial Robots with Real Time Vision for Disaster Management
- Image reconstruction and restoration
- Computational Photography
- Morphological Image Processing
- Animat Vision
- Photogrammetry
 - and many others in different implementation areas

1.2 Prominent Tools for Computer Vision & Image

Analytics

A number of tools and libraries are available to perform the implementations and approaches of computer vision.

Following are few of the prominent tools and libraries for computer vision and image analytics

Tool	URL
OpenCV	http://www.opencv.org/
BoofCV	http://www.boofcv.org/
NASA Vision Workbench	http://ti.arc.nasa.gov/tech/asr/intelligent-robotics/nasa-vision-workbench/
SimpleCV	http://simplecv.org/
Tesseract	https://github.com/tesseract-ocr/tesseract
SLIC Superpixels	http://ivrl.epfl.ch/supplementary_material/RK_SLICSuperpixels/
OpenMVG	https://github.com/openMVG/openMVG
LIBVISO	http://www.cvlibs.net/software/libviso/
VisualSFM	http://homes.cs.washington.edu/~ccwu/vsfm/
MeshLab	http://meshlab.sourceforge.net/
Bundler	http://phototour.cs.washington.edu/bundler/
Vid.stab	https://github.com/georgmartius/vid.stab
ViSP	https://visp.inria.fr/

OpenCV: A High Performance Library for Computer Vision:

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OpenCV (Open Source Computer Vision Library) is one of the multi functional as well as powerful libraries that is used for the image forensic based applications so that the hidden footprints and the features from the images can be extracted and predicted with higher degree of accuracy and performance.

OpenCV is a high performance library for digital image processing and computer vision under free and open source distribution [5, 6, 7]. It is equipped with the large set of functions and algorithms for real-time computer vision and predictive mining. OpenCV was devised and developed by Intel and the current instances are supported by W. Garage and Itseez. OpenCV was developed so that the real time analytics of images and recognition can be done for assorted application areas [8, 9].

1.3 Statistical Machine Learning library used by OpenCV

- Boosting (meta-algorithm)
- Naive Bayes classifier
- Deep Neural Networks (DNN)
- Gradient boosting trees
- Support vector machine (SVM)
- k-nearest neighbor algorithm
- Decision tree learning
- Expectation-maximization algorithm
- Random forest
- Convolution Neural Networks (CNN)
- Artificial Neural Networks

1.4 Installation of OpenCV

The installation of OpenCV can be done for different programming languages including Python, Java, C++ and many others. OpenCV provides open connectivity with other platforms and programming languages so that the algorithms of computer vision can be implemented without any concerns of compatibility or dependencies. OpenCV can be installed on different platforms including Android, Windows, Linux, BlackBerry, FreeBSD, OpenBSD, iOS, Maemo or OS X.

1.4.1 Interfacing Python and OpenCV

OpenCV is having open connectivity for installation with different software suites. Following is the statement to integrate OpenCV with Scilab

```
Programming
--> atomsInstall("sciv")

--> atomsInstall("IPCv")
```

OR

```
--> atomsInstall("Source Zip File")
```

To install OpenCV for Python, following statements are executed

```
$ python -m pip install opencv-python
$ python -m pip install opencv-contrib-python
```

$$a + b = \gamma \quad (1)$$

1.5 Real Time Image Capturing from Web Cam using OpenCV

In traditional implementations, the feature points of the images and computer vision files are recognized on the pre-saved disk images. This approach can be further enhanced using OpenCV. Using OpenCV, the real time video can be marked with the feature points or key points of the image frame in live running video. Following is the source code of OpenCV that is executed in Python Environment that can be used for the implementation for recognizing real time live feature points from a web cam video [10, 11].

```
import numpy as currentscenarionumpy
import cvv
mycap = cvv.VideoCapture(0)
while(True):
    ret, frame = mycap.read()
MyGray=cvv.cvtColor(frame,
cvv.COLOR_BGR2MYGRAY)
MyGray = currentscenarionumpy.float32(MyGray)
tdst = cvv.cornerHarris(MyGray,2,3,0.04)
tdst=cvv.dilate(tdst,None)
frame[tdst>0.01*tdst.max()]=[0,0,255]
cvv.imshow('tdst',frame)

if cvv.waitKey(1) & 0xFF == ord('q'):
    break ;
mycap.release()
cvv.destroyAllWindows()
```

• 2. Identification of Image Forgery using OpenCV

With the emergence and implementation of digital authentications in assorted applications, the identification of original user impressions is one of the key challenges in today's scenario [12]. Now days, many organizations ask the documents and certificates signed and scanned by the applicants for self attestation. Even this scenario is happening in the issuing of new mobile SIM cards. Many times, it happens that the fake persons take the scanned signatures from any other document and put in the required document using digital image editing tools like Adobe PhotoShop, PaintBrush, PhotoEditors or any other. There are number of image editing tools available which are used for the transformation of actual image to a new image.

This type of implementation can be (and many times is) used for creating the new forged copy of the document without knowledge and permission of the actual person. Following is the depiction of forgery detection in the new document where the signatures are copied from other source

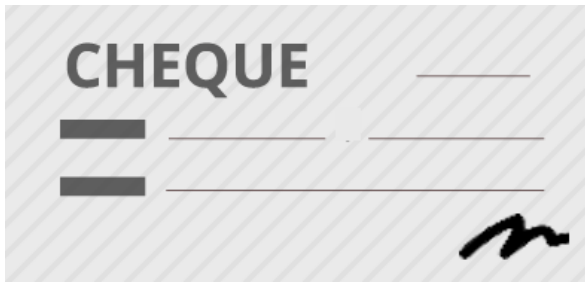


Figure 1 : Scanned Image of Original Cheque

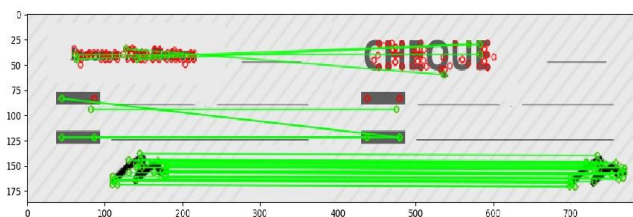


Fig 2: if necessary, the images can extended both columns

a) **Change number of columns:** Select the “Columns” icon from the MS Word Standard toolbar and then select “1 Column” from the selection palette.

It is evident from Figure that the pixels are identified in the new image in which the signature is copied from other source. By this methodology, the marking of pixel values can be done using machine learning and in-built effective methods for prediction in OpenCV. Even if the person makes use of highly effective tools for image editing, the pixels can be pointed out from where the image segment is taken

II. CONCLUSION

The usage of computer vision and machine learning is very effective for the document forensic with the deep evaluation of the watermark and hidden patterns including the copy move forgery. This paper underlined the use of OpenCV as the high performance framework for the document forensic with the cavernous analytics on the forensic investigation

REFERENCES

1. Pan X, Lyu S. Region duplication detection using image feature matching. *IEEE Transactions on Information Forensics and Security*. 2010 Dec;5(4):857-67. Hartley R, Zisserman A. *Multiple view geometry in computer vision*. Cambridge university press; 2003.
2. Se S, Lowe D, Little J. Vision-based mobile robot localization and mapping using scale-invariant features. In *Robotics and Automation, 2001. Proceedings 2001 ICRA. IEEE International Conference on 2001 (Vol. 2, pp. 2051-2058)*. IEEE.
3. Agrawal M, Konolige K. Real-time localization in outdoor environments using stereo vision and inexpensive gps. In *Pattern Recognition, 2006. ICPR 2006. 18th International Conference on 2006 Aug 20 (Vol. 3, pp. 1063-1068)*. IEEE.
4. Variani E, Lei X, McDermott E, Lopez-Moreno I, Gonzalez-Dominguez J. Deep neural networks for small footprint text-dependent speaker verification. In *ICASSP 2014 May 4 (Vol. 14, pp. 4052-4056)*.
5. Bradski G, Kaehler A. *OpenCV. Dr. Dobb’s journal of software tools*. 2000;3.

6. Laganière R. *OpenCV Computer Vision Application Programming Cookbook Second Edition*. Packt Publishing Ltd; 2014 Aug 26
7. Bradski G, Kaehler A. *Learning OpenCV: Computer vision with the OpenCV library*. " O’Reilly Media, Inc."; 2008 Sep 24
8. Sobral A. *BGSLibrary: An opencv c++ background subtraction library*. In *IX Workshop de Visao Computacional 2013 Jun (Vol. 2, No. 6, p. 7*
9. Culjak I, Abram D, Pribanic T, Dzapo H, Cifrek M. A brief introduction to OpenCV. In *MIPRO, 2012 proceedings of the 35th international convention 2012 May 21 (pp. 1725-1730)*. IEEE
10. Howse J. *OpenCV computer vision with python*. Packt Publishing Ltd; 2013 Apr 23
11. Hossain N, Kabir MT, Rahman TR, Hossen MS, Salauddin F. A real-time surveillance mini-rover based on OpenCV-Python-JAVA using Raspberry Pi 2. In *Control System, Computing and Engineering (ICCSCE), 2015 IEEE International Conference on 2015 Nov 27 (pp. 476-481)*. IEEE

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