

Research Paper on Machine Learning and Augmented Reality based Writing in Air

Bhoomi Gupta¹ Garima Arora² Manaswi Batra³

^{1,2,3}Maharaja Agrasen Institute of Technology, India

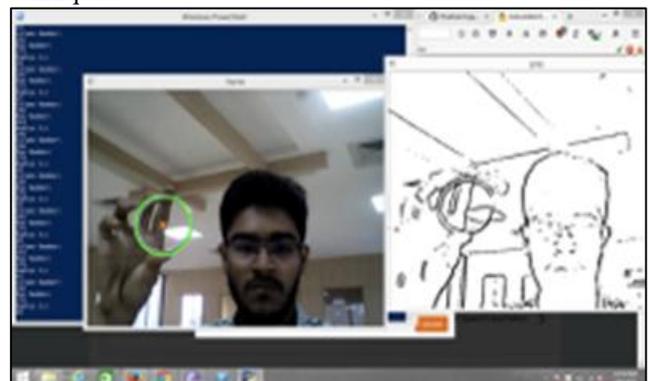
Abstract— We use our hands constantly to interact with things: pick them up, move them, transform their shape, or activate them in some way. With the advancement of modern technologies areas related to robotics and computer vision, real time image processing and Object Tracking has become a major technology under consideration. By using open source computer vision library (OpenCV for short), an image can be captured on the bases of its hue, saturation and color value (HSV) range. The basic library functions for image handling and processing are used. Basic library functions are used for loading an image, creating windows to hold image at run time, saving images, and to differentiate images based on their color values. I have also applied function to threshold the output image in order to decrease the distortion in it. While processing, the images are converted from their basic scheme Red, Green, and Blue (RGB) to a more suitable one that is HSV. This project was an attempt at developing an object detection and tracking system. The project delivers an implemented tracking system. It is stable and is applicable as a stand alone system. In this project, we design a real-time human computer interaction system based on hand gesture. The whole system consists of three components: hand detection, gesture recognition and human-computer interaction (HCI) based on recognition. Considerable effort has been put towards developing intelligent and natural interfaces between users and computer systems. This is done by means of a variety of modes of information (visual, pen, etc.). The use of gestures as means to convey information is an important part of human communication. The automatic recognition of gestures enriches Hu-man-Computer Interaction by offering a natural and intuitive method of data input. Also, we summarize and discuss the main works proposed so far with particular interest on how they treat the temporal dimension of data, their high-lighting features, and opportunities and challenges for future research. The overall model is designed to be a simple gestural interface prototype for various PC applications.

Keywords: OpenCV, HSV, RGB, Threshold

I. INTRODUCTION

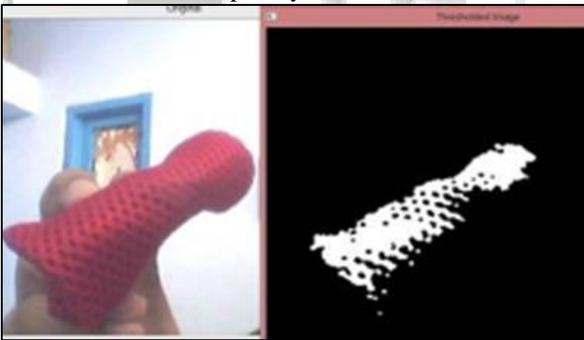
Object detection and location in digital images has become one of the most important applications for industries to ease user, save time and to achieve parallelism. This is not a new technique but improvement in object detection is still required in order to achieve the targeted objective more efficiently and accurately. Given the real time webcam data, this application will use OpenCV library to track an object and allows the user to draw by moving the object in the air. A variety of problems of current interest in computer vision require the ability to track moving objects in real time for purposes such as surveillance, video conferencing, robot navigation, etc. The fundamental challenges that drive much of the research in this field are the enormous data-bandwidth implied by high resolution frames at high frame rates, and the desire for real-time interactive performance. Color has been

widely used in real-time tracking systems. It offers several significant advantages over geometric cues such as computational simplicity, robustness under partial occlusion, rotation, scale and resolution changes. Although color methods proved to be efficient in a variety of vision applications, there are several problems associated with these methods of which color constancy is one of the most important. In the tracking system implemented, the color blobs are being tracked. The notion of blobs as a representation for image features has a long history in computer vision and has had many different mathematical definitions. This property could be color, texture, brightness, motion, shading and the combination of these. Tracking can be characterized as the problem of assessing the trajectory of an object in the picture or image plane as it moves around a scene. The requirement for high power PCs, the accessibility of high quality and modest camcorders, and the expanding requirement for automated feature analysis has produced a lot of interest for object tracking algorithms. There are three key steps in feature analysis: recognition of target moving objects, tracking of such objects from frame to frame, and analysis of object tracks to perceive their conduct. In its least complex form, tracking can be characterized as the issue of evaluating trajectory of an object in the image plane as it moves around a scene. The main goal of this investigation is to track the real time moving objects in different video frames with the assistance of a proposed algorithm and converting it into the text format. The process of object detection analysis is to determine the number, location, size, position of the objects in the input image. Object detection is the basic concept for tracking and recognition of objects, which affects the efficiency and accuracy of object recognition. The common object detection method is the color-based approach, detecting objects based on their color values. The method is used because of its strong adaptability and robustness, however, the detection, because it re-quires testing all possible windows by exhaustive search and has high computational complexity. Object detection from a complex background is a challenging application in image processing. The goal of this project is to identify objects placed over a surface from a complex background image using various techniques.



II. INTRODUCTION TO PYTHON AND OPENCV

- Python is a general-purpose interpreted, interactive, object-oriented, and high-level programming language. It was created by Guido van Rossum during 1985- 1990. Like Perl, Python source code is also available under the GNU General Public License (GPL). This tutorial gives enough understanding on Python programming language. Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages. OpenCV is an open source computer vision library. The library is written in C and C++and runs under Linux, Windows and provides interfaces for Python, Ruby, Matlab and other languages. OpenCV library contains abundant advanced math functions, image processing functions, and computer vision functions that span many areas in vision. A. Basic Class OpenCV 1.0 includes the following five modules :
- 1) CxCore: Some basic functions (various data types and basic operations, etc.).
 - 2) CV: Contains image processing and computer vision function(image processing, structure analysis, motion analysis, and object tracking, pattern recognition, and camera calibration).
 - 3) CvAux: Some experimental functions (View Morphing, Three-dimensional Tracking, PCA, HMM).
 - 4) HighGUI: Contains user interface GUI and im-age/video storage and recall
 - 5) CvCam: Camera interface (After OpenCV 1.0 version, CvCam will be completely removed.).



III. METHOD REVIEW

We aim to detect text written in the air using a certain object from the real time video. This will involve:- Detecting the object. Tracking the movement. Analysing the detected path to obtain the text. Extracting the Coloured Object: With the help of Reading the frame and extracting the RGB values. Thresholding the image for a range of desired color and then Extracting the green object. Tracking The Movement: By Keeping track of all point where object visited with the help of contours (i.e“outlines”) of the objects and When at least one object is found, take the point as the center of the contour and then joining the lines. Text Conversion: Nowadays, “Image processing” is normally used by a wide range of applications and in different types of electronics like computers, digital cameras, mobile phones etc. The image properties can be changed with the least investment such as

contrast enhancement, borders detection, intensity measurement & apply different mathematical functions to enhance the imagery. Text recognition of an image is a very useful step to get the recovery of multimedia content. The proposed system is used to detect the text in images automatically and remove horizontally associated text with difficult backgrounds. scikit-image is an image processing Python package that works with numpy arrays which is a collection of algorithms for image processing. We will create a dataset based on our own handwriting and we will compare the image with the images of this dataset based on similarity.

IV. SSIM

It is a research based project and functionality of the projects will increase as we explore it. Structural Similarity Index (SSIM) for measuring image quality. The Structural Similarity (SSIM) Index quality assessment index is based on the computation of three terms, namely the luminance term, the contrast term and the structural term. The overall index is a multiplicative combination of the three terms.

V. FUTURE SCOPE

Future work will include the Human Face Detection based on the generation of the 3D geometric data from the 2D image input. Moving object detection is a basis for a number of important applications such as real-time surveillance and visual tracking. However, it is computationally expensive and resource hungry. Face recognition may also be implemented Virtual mouse controller may also be implemented by time, controlling the movement of mouse pointer on the computer screen virtually just by waving our hands. Hand Gesture Recognition will also be an area open to work upon, making your computer system to work just by changing your hand positions and gestures.

VI. CONCLUSION

Prototype system for color based object detection is successfully implemented and tested. The test results show that the detection method used in the paper can accurately detect and trace any object in real time. This project shows the methods of Image processing and detecting an object in it based on its specific color, by using OpenCV real time implementation is possible. Thresholding of the generated image is necessary in order to segment the image pixels and let them free from each other. Python has been preferred over MATLAB for integrating with OpenCV because when a Matlab program is run on a computer, it gets busy trying to interpret all that Matlab code as Matlab code is built on Java. OpenCV is basically a library of functions written in C\C++. Additionally, OpenCV is easier to use for someone with little programming background. So, it is better to start researching on any concept of object detection using OpenCV-Python. Feature understanding and matching are the major steps in object detection and should be performed well and with high accuracy. Future work includes so many possibilities related to the hand gestures recognition, virtual mouse controller, and also the face detection and recognition.

REFERENCES

- [1] Viraktamath SV, Mukund Katti, Aditya Khatawkar, Pavan Kulkarni, "Face Detection and Tracking using OpenCV," The SIJ Transaction on Computer Networks & Communication Engineering (CNCE), 2013, 1(3).
- [2] Pant A, Arora A, Kumar S, Arora RP. "Sophisticated Image secret writing exploitation OpenCV," International Journal of Advances Research in Computer Science and Software Engineering, 2012, 2(1).
- [3] Kevin Hughes – an added golem learn to exam-ine (<http://kevinhughes.ca>)
- [4] Belongie S, Malik J, Puzicha J. "Shape Matching and beholdng exploitation form contexts," IEEE Transactions on Pattern Analysis and Machine Intelligence, 2002; 24(4):509-522,
- [5] Abdesselam Bouzerdoum, Azeddine Beghdadi and Philippe L. Bouttefroy , "On the analysis of background subtraction techniques using Gaussian mixture models," 2010 IEEE International Conference on Acoustics, Speech, and Signal Processing (pp. 4042-4045). USA: IEEE.
- [6] Bhoomi Gupta , "http://jardcs.org/backissues/abstract.php?archiveid=6346" , A Novel Approach for Multi Exposure Image fusion using Deep Learning , Journal of Advanced Research in Dynamics & Control Systems, Vol. 10, 14-Special Issue, 2018, ISSN 1943-023X, pg. 1526-1531.
- [7] Nidhi, "Image Processing and Object Detection", Dept. of Computer Applications, NIT, Kurukshetra, Haryana, 1(9): 396-399, 2015.

