Face Detection and Recognition

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Abstract - *Key issues on using a new programming language - C# - in implementation of a face detection and recognition (FDR) system are presented. Mainly the following aspects are detailed: how to acquire an image, broadcast a video stream, manipulate a database, and finally, the detection/recognition phase, all in relation with theirs possible C#/.NET solutions. Emphasis was placed on artificial neural network (ANN) methods for face detection/recognition along with C# object-oriented implementation proposal.*

***Key Words*: C# / .NET, Face Detection and Recognition.**

1.INTRODUCTION

In today's times, cameras became a significant role player and may be seen everywhere, from the smart phone in our pocket to the surveillance cameras in our campus to the microscopic cameras employed in medical sciences and then on. the sector of computer vision has seen a meteoric rise within the recent past, with the event of a good type of techniques to accomplish certain tasks. These tasks include motion analysis, scene reconstruction, image restoration and image matching. During this study, we've got focused on various image matching techniques and algorithms. we've got compared their performances, eventually suggesting the simplest technique out of all the considered techniques. it should happen that a number of these algorithms/techniques work better with certain data sets, while others aren't as effective in analyzing the identical data sets. Hence, certain algorithms influence be useful for an application while others have different usage. As mentioned within the text above, computer vision algorithms are widely wont to recognize, manipulate and extract details from image data. These processes are conducted with the assistance of assorted algorithms and techniques. Each algorithm has its unique way of identifying and governing the information that's to be modified. Every algorithm is exclusive from the opposite one and efficiency criteria differ in each case, although the aim of the algorithm is that the same i.e. image matching. Image matching could be a sub domain of computer vision, which focuses on finding a similarity or multiple similarities between a collection of images and eventually matching them i.e. considering them the identical. This task of matching similar images has been accomplished using various algorithms.

2. LITERATURE REVIEW

In the past few centuries, with the increase in robotics studies and experimenting, the utilization of high-quality camera sensors with high zooming capabilities has increased manifold. getting to provide vision capabilities alike persons, cameras generate a good kind of images which are required to be examined and assessed for further research and to get meaningful solutions for a given problem. during this paper, an insight has been provided on how various image recognition and tracking algorithms perform on various datasets. a good range of datasets are chosen, starting from hand gestures to shapes and objects to handwritten manuscript text, etc. The algorithms whose performance is being analyzed are namely Blob detection method, Template matching algorithm and S.U.R.F Algorithm. we've compared these image matching algorithms supported various measures like accuracy, processing speed, flexibility to use for various data sets, invariance to rotation, scale and illumination, etc.

Every image is identified using its unique set of features. These features are exclusive for every image and hence help in subsequent identification and discrimination between images. Features may be characterized because the interest focuses or an "interesting" a part of an image, which are utilized as a beginning stage for a few computer vision calculations.

Since, components are utilized because the beginning stage and principle primitives for resulting algorithms, the final algorithm will regularly just be within the same class as its feature detector. Therefore, the alluring property for a feature detector is repeat ability: irrespective of whether the identical feature is identified in two or more diverse pictures of the identical scene. Feature identification may be a low-level image processing operation. That is, it is typically executed because the main operation on an image and analyses each pixel to test whether there is a component present at that pixel. On the off chance that this is often a component of an even bigger algorithm, then the calculation will regularly just inspect the image within the locale of the features. In computer vision and image processing the thought of feature identification alludes to techniques that go for figuring deliberations of picture data and deciding on nearby choices at each image point whether there's a picture feature of a given sort by then or not.

3. TECHNIQUES

In this paper, we've considered three image matching techniques for performance comparison.

A) Blob detection technique

B) Template matching

C) SURF feature extraction

3.1 Blob Detection Technique-

Blob location strategies consider discovering regions that contrast in several properties, as an example, brightness or shading, contrasted with encompassing locales, during a digital image. Blob could be a locale of a picture within which some properties are steady or around consistent and each {one of one among one during alone amongst one in every of} the points in a blob will be considered in some sense to be like one another. Algorithm for blob detection technique utilized by us is given below: This algorithm works by capturing the image from the webcam or the other camera in one amongst the given formats. {e.g. MJPG_1280x720, MJPG_160x120, MJPG_176x144, MJPG_320x240, MJPG_352x288, MJPG_640x360, YUY2_640x360, and YUY2_640x480}
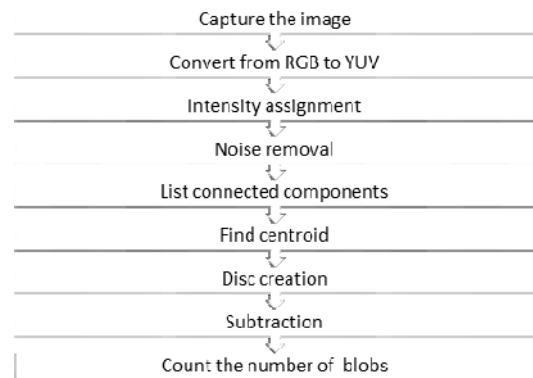

Fig -1: Blob Detection Algorithm Flow Diagram

3.2 Template Matching-

Format Matching is an elevated level machine vision strategy that recognizes the parts on a picture that coordinate a predefined design. The calculation is:

i.   A picture having writings (may be in debased structure) or items is taken as info and changed over into dim scale picture.

ii. It is gone through Gaussian channel so as to smoothen the messed-up edges and commotion.

iii. It is gone through other pre-preparing channels like widening, commotion pixel expulsion step, thresholding, and so forth (messages or articles in white).

iv. All the different white locales are set apart as various articles and checked, trimmed to its base size. A jumping box is made around each item.

v.   After that, the item district is resized to the size of formats and afterward each article is contrasted with all the layouts pre-spared in a lattice.

vi. corr2 (format {1, n}, burn) is a capacity that ascertains the connection in the layout picture and the test object picture. The layout picture which has the most elevated connection coefficient is set apart as recognized item or content.

vii. Similarly, all the writings or articles are looked at and the outcomes are put away in a book record which is shown toward the finish of the program.

Layout Matching techniques are depended upon to address the essential of recognizing all information picture territories at which the format picture article is accessible. Dependent upon the specific issue near to, the customer may (or may not) want to perceive the rotated or scaled occasions.

3.3 SURF Feature Extraction-

SURF (Speeded Up Robust Features) is a powerful nearby component locator, , at first presented by Herbert Bay et al.

in 2006, that can be used as a piece of PC vision assignments like item acknowledgment or 3D reproduction. It is to some degree impelled by the SIFT descriptor. The standard rendition of SURF is a couple of times speedier than SIFT and more vivacious against different picture changes than SIFT. SURF depends on entireties of 2D Haar wavelet reactions and proficiently uses the essential pictures. It utilizes a number guess to the determinant of Hessian mass finder, which can be registered incredibly rapidly with a vital picture (3 whole number activities). For highlights, it utilizes the aggregate of the Haar wavelet reaction around the focal point.
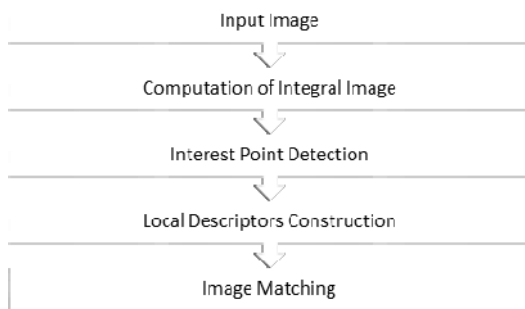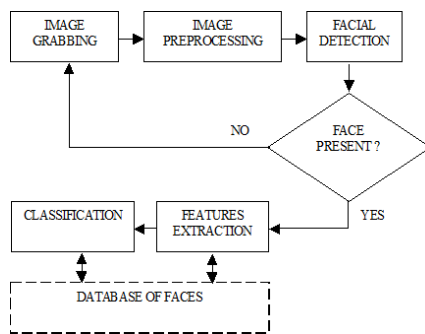

Fig -1: SURF Algorithm Flow Chart

Coordinating is accomplished by looking at different sorts of descriptors which have been gotten from the various kinds of pictures. Henceforth, coordinating sets can be found.

4. METHODOLOGY

Emgu CV is a cross stage .Net wrapper to the Intel OpenCV picture preparing library. Permitting OpenCV capacities to be called from .NET good dialects, for example, C#, VB, VC++, IronPython and so on. The wrapper can be gathered in Mono and run on Linux/Mac OS X.

In my own words EmguCV is a great Wrapper, this let make extremely intriguing things and undertakings of PC vision, this library set let do a boundless measure of brilliant tasks in this field, EmguCV have numerous capacities that let us work with CPU and GPU expands the presentation drastically with the most recent referenced.

Parameters:

haarObj: Haar classifier course in interior portrayal scaleFactor: The factor by which the hunt window is scaled between the ensuing outputs, for instance, 1.1 methods expanding window by 10%

minNeighbors: Minimum number (less 1) of neighbor square shapes that makes up an item. All the gatherings of fewer square shapes than min_neighbors-1 are dismissed. On the off chance that min_neighbors are 0, the capacity doesn't any gathering whatsoever and restores all the distinguished competitor square shapes, which might be helpful if the client needs to apply a modified gathering system

banner: Mode of activity. At present the main banner that might be indicated is CV_HAAR_DO_CANNY_PRUNING. In the event that it is set, the capacity utilizes Canny edge identifier to dismiss some picture areas that contain excessively not many or a lot of edges and along these lines can't contain the looked through item. The specific limit esteems are tuned for face discovery and for this situation the pruning speeds up the preparing.

minSize: Minimum window size. As a matter of course, it is set to the size of tests the classifier has been prepared on (~20x20 for face location).

5. CONCLUSIONS

In view of the element recognition and highlight extraction strategies examined above, we have seen that SURF calculation is the outstanding amongst other option for picture coordinating issues. In this report, we have talked about different significant strategies like Blob discovery calculation, Template coordinating technique, SIFT and SURF calculations. We have seen that Blob location calculation confines us to the quantity of motions with lower precision and slower throughput. Format coordinating methods is marginally better with middle multifaceted nature and precision. Anyway, with expanding number of layouts, the effectiveness and the throughput of the calculation is unfavorably influenced. On the side of the announcements, we have put the tried pictures and the relating yields. At long last, SURF calculation is talked about with its middle of the road ventures alongside the tried pictures and their yields. We have tried the calculation close by motions, recognizing objects out of an image, letters, and words from writings in English and Tamil language and found that it worked with extraordinary precision and quicker speed. We likewise tried it by pivoting and scaling the items and discovered that the calculation indicated right outcomes in 90% of the cases.

SURF calculation has discovered to be one of the most powerful element location strategy However it has certain restrictions excessively, for example, if there should be an occurrence of low enlightened pictures, recognizing the articles would be somewhat troublesome, which will be an improvement course for the future work.

REFERENCES

[1] Sankowski, Dominik, and Jacek Nowakowski, eds. PC Vision in Robotics and Industrial Applications. World Scientific, 2014.

[2] Grimson, W. Eric L., and Joseph L. Mundy. "PC vision applications."Communications of the ACM 37.3 (1994): 45-51.

[3] Kagami, Shingo. "Fast vision frameworks and projectors for constant view of the world." 2010 IEEE Computer Society Conference on Computer Vision and Pattern Recognition-Workshops. IEEE, 2010.

[4] "Highlight Detection and Extraction - MATLAB and Simulink", In.mathworks.com, 2016.

[5] "Nearby Feature Detection and Extraction - MATLAB and Simulink", In.mathworks.com, 2016.

[6] Lowe, David G. "Particular picture highlights from scale-invariant keypoints."International diary of PC vision 60.2 (2004): 91-110.

[7] Briechle, Kai, and Uwe D. Hanebeck. "Format coordinating utilizing quick standardized cross relationship." Aerospace/Defense Sensing, Simulation, and Controls. Global Society for Optics and Photonics, 2001.

[8] Jia, Di, et al. "Shading FAST (CFAST) coordinate: quick relative format coordinating for shading pictures." Electronics Letters (2016).

[9] Verma, Nishchal Kumar, et al. "Item Matching Using Speeded Up Robust Features." Intelligent and Evolutionary Systems. Springer International Publishing, 2016. 415-427.

[10] Andersson, Oskar, and Steffany Reyna Marquez. "A correlation of item identification calculations utilizing unmanipulated testing pictures: Comparing SIFT, KAZE, AKAZE and ORB." (2016).

[11] Zhou, Yimin, Guolai Jiang, and Yaorong Lin. "An epic finger and hand present estimation strategy for continuous hand signal acknowledgment." Pattern Recognition 49 (2016): 102-114.

[12] Bay, Herbert, Tinne Tuytelaars, and Luc Van Gool. "Surf: Speeded up hearty highlights." European meeting on PC vision. Springer Berlin Heidelberg, 2006.