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Boundary Detection Algorithm for Tracking Coloured Objects using Opencv

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Abstract: In this research work, an open CV based image processing algorithm proposed to track objects in image. In the present research work, a different approach is proposed for segmentation of image data in the presence of intensity inhomogeneities. This formulation allows the labeling of a pixel to be influenced by the labels (colored objects) in its immediate neighborhood. The neighborhood effect acts as a regulariser and biases the solution towards piecewise homogeneous labeling. In this work, optimal texture features are identified for classification of colored objects. The texture features are extracted from the ROI in images. The classifier is trained to classify the features into different colored objects.

Keywords: FL 2440 Board, OpenCV, Linux, C++

I. INTRODUCTION

Automated analysis of object detection, by which different quantitative features of anatomic structures are extracted, generally requires a preprocessing step to remove image intensity inhomogeneity, which is also referred to as bias field, intensity non-uniformity, or shading. This artifact is perceived as a smooth variation of intensities across the image because of which intensities of the same anatomical structures are not constant across the image.

In imaging, intensity inhomogeneity may be induced by a number of factors, such as poor radio frequency coil uniformity, static field inhomogeneity, radio frequency penetration, gradient-driven eddy currents, and overall object position. Intensity inhomogeneity correction is difficult because it depends on the imaged object and thus cannot be eliminated by scanner calibration. Therefore, retrospective correction methods are usually required to remove the intensity inhomogeneity's.

II. RELATED WORKS

Junbin Liuet al. (2014) proposed a method of curvelet transform to obtain features of the edge of images. This paper overcomes the limitation of existing wavelet transform. The curvelet transform can get more representation of sparse images than the wavelet transforms on the representation of the singular of the edges of image curve. As the same time, the k-nearest neighbor algorithm is used to recognize different expression in this paper. The result shows that the proposed algorithm in this paper is more effective than the wavelet transforms in expression recognition. S. M. Gramopadhye and R. T. Patil (2014) describes the transplantation of the Linux operating system as well as implementation of object detection system using USB camera based on the mini2440 development board. The transplantation of Embedded Linux includes the development of cross compile environment, the compilation of boot loader, porting of Linux kernel and the construction of root file system. Then implementation of USB camera based object detection system on Qt creator for the mini 2440 board. Changyang Li, at al., [2013] proposed a new energy framework with distribution descriptors for image segmentation. Segmentation of the target object(s) from images that have multiple complicated regions, mixture intensity distributions or are corrupted by noise poses a challenge for the level set models.

III. EXISTING METHOD

The conventional methods are depends on the region growing andthresholding. Spatial characteristics are ignored by conventional thresholding method. Usually spatial characteristics are essential for the tracking coloured object identification. In the thresholding based segmentation the image is considered as having only two values either black or white. But the bit map image contains 0 to 255 grey scale values. So sometimes it ignores the objects also. In case of the region growing based segmentation, it needs more user interaction for the selection of the seed. Seed is nothing but the centre of the objects; it may cause intensity in homogeneity problem and it will not provide the acceptable result for all the images.

In existing method, the background value is assigned to binary value 0 and object gets the value 1. So extract the tracking of coloured objects is complicate from the image. This is the main drawback of the existing system. The existing method has little drawback from the proposed method. The existing method is based on thersholding approach.

The main drawback of this method is when the input image is with coloured objects, the output image does not show it up to the level, since the threshold method consist only two colors which displayed in output.

IV. METHODOLOGIES USED IN OBJECT TRACKING IN IMAGE

- Image analysis
- Histogram equalisation
- Thresholding
- Features extraction
- Size and Region location

The block diagram of proposed image processing method is shown in figure 1.

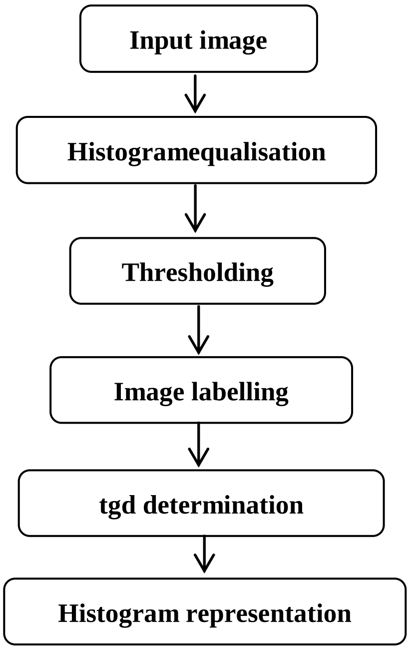

Figure 1 : Proposed image processing technique

A. Histogram Equalization
Histogram equalization is a technique for adjusting image intensities to enhance contrast. The histogram equalization is an approach to enhance a given image. The approach is to design a transformation T(.) such that the gray values in the output is uniformly distributed in [0, 1].

Histogram equalization yields an image whose pixels are (intheory) uniformly distributed among all gray levels. The Histogram Equalisation Flow is shown in figure 2.

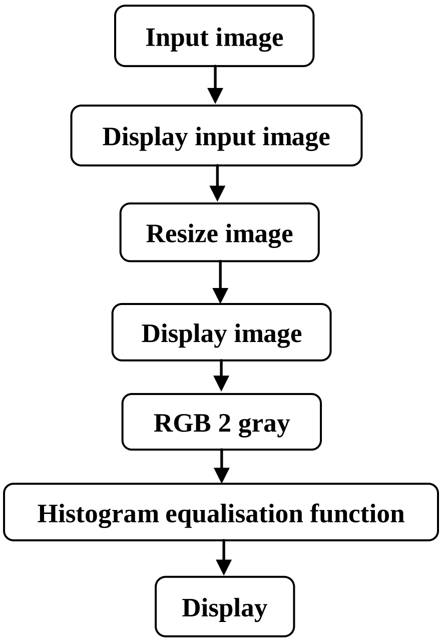

Figure 2 :Histogram Equalisation Flow

B. Image segmentation in Histogram equalization
The purpose is to subdivide an image into meaningful non-overlapping regions, which would be used for further analysis

1. The intensity values are different in different regions, and,
2. Within each region, which represents the corresponding object in a scene, the intensity values are similar.

The intensity of objects is different from the background.Image segmentation can be done by method of “Thresholding”.

C. Thresholding
Image thresholding classifies pixels into two categories:Those to which some property measured from the image falls below a threshold and those at which the property equals or exceeds a threshold.Thresholding converts a grey image into a binary image. In figure 3, the image segmented by pixel values. Three feature vectors extracted by image segmentation.

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1	1	1	1	1	1	1	2
1	1	1	2	2	2	2	2
1	1	2	2	2	2	1	2
3	3	1	2	2	2	1	2
3	3	1	2	2	2	1	2
3	3	1	1	1	1	1	1

Figure 3: Image segmentation using pixel values

D. SOM clustering

SOM method is used to automatically perform clustering-based image thresholding or, the reduction of a greylevel image to a binary image.The algorithm assumes that the image to be thresholded contains two classes of pixels or bi-modal histogram (e.g. Foreground and background) then calculates the optimum threshold separating those two classes

img2=im2bw(img1, graythresh(img1));

The block diagram of neural network used in SOM clustering is shown in figure 4.

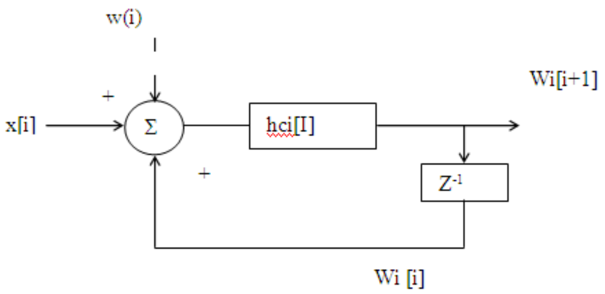

Figure 4 : Neural network diagram

The workflow of SOM for object identification is shown in figure 5.

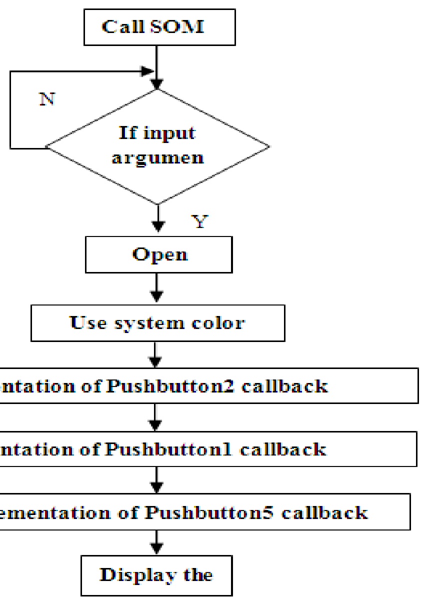

Figure 5 : Workflow of SOM for object identification

E. Labelling and estimation

A set of pixels in an image which are all connected to each other is called a connected component.All connected components in an image are found out and marked each of them with a distinctive label and it is called connected component labeling. Connected component labeling is used to count the number of objects. The object detections based on various features and their description is shown in table 1.

Table 1 Object Detection Based on Various Features and Their Description

S.NO	STATIC FEATURES	FEATURES DESCRIPTION
1	Features Based on Color	Color histograms, a mixture of Gaussian models, color moments, color coral grams etc. are in the features of color based
2	Features Based on Texture	They are relevant to surface owned to object visual built-in features; they are autonomous in intensity or color, as well as in images, they reflect the homogeneous phenomena
3	Features Based on Shapes	The technique of detecting edges in the images is used and after that by using histogram, the edges are distributed.
4	Features Based on Position	The technique of detecting edges based on angle

V. OPEN CV

OpenCV is an open source computer vision and machine learning software library. OpenCV is written natively in C++ and it has C++, C, Python, Java and MATLAB interfaces and supports Windows, Linux, Android and Mac OS.

Python is a general purpose programming language which is used in this work because of its simplicity and code readability. OpenCV-python is a Python API of OpenCV. It is the combination of OpenCV C++ API and Python language. OpenCV-Python works as a wrapper around original C++ implementations.

Python allows the designer to implement code or express ideas in fewer lines of code without losing readability. Hence, computationally intensive codes can be written in Python.Open CV image processing library is used to process the input image. This is written in C++ but has bindings with Python and Java.

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VI. IMPLEMENTED HARDWARE

A. System requirements

OS: LINUX
Image processing library: open CV
Development board: FL 2440

The hardware implementation results using the FL2440 ARM-9 board is shown in figure 4.15. In this work, Linux platform and open CV used for boundary detection which is suitable for embedded system implementation. Processing the proposed method is done by the FL 2440.

FL 2440 is connected with PC to display processed output. Input image is sent to the FL2440 board which detects the objects location using open CV target code.

Figure: 4.1 : Implemented Hardware

VII. SIMULATION SETUP AND RESULTS

The tracking color objects are implemented in FL 2440 board. The red color object in figure 6.6 is given to the FL2440 board as input image. The tracked output image is shown in figure 6.7.

Figure 6: Input image with red color object

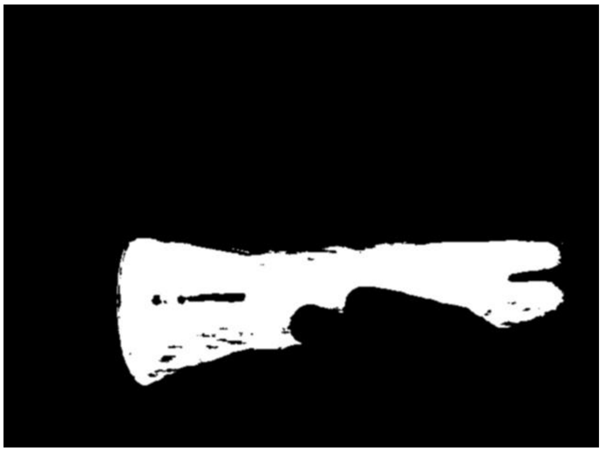

Figure 6.1: Tracked red color object

The input path of the image is given as input. The height and width of the image is calculated. The RGB color based segmentation is applied to the image. The each color (red, blue and green) is counted and the total pixel of the image is calculated. And the percentage of the image is calculated. This is shown in figure 6.8.

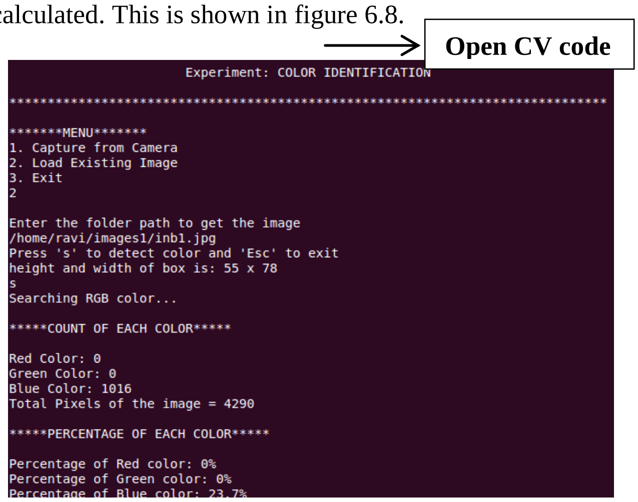

Figure 6.8 Color identification

VIII. CONCLUSION

In this work, software that could be scalable, plug and play and easy to modify by other researchers is presented. This research work is based on computer aided method using open CV and embedded system for detection of colored objects with accuracy and reproducibility compared to other detection and is also compatible with hand held devices. This method for detection of range and shape of colored image in image using embedded system reduces the time complexity for detection of colored objects.

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