



Web camera automatic object detection with graphical representation of the object total appearance time

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Abstract

Inability to identify objects accurately for a long time has been a challenge to claiming ownership, justice, and securing life and property. Previous methods employed to provide solution to these problems proved unsatisfactory. Many of the algorithms used in the previous methods could no longer handle the challenges confronting today's identification tasks. This paper is a novel approach to detecting object whether static or on motion in web camera. The algorithmic program used was developed using OpenCV python modules. Initial and subsequent captured object's images were saved in a frame before converting them to Gaussian blur images. The difference between the initial and subsequent images was calculated and their threshold defined to remove the shadows and other noises. Borders of the objects were defined before a rectangular box was added around the object. Then, the time when the object appeared and exited the camera was also calculated.

Keywords: identification, algorithm, opencv, python, gaussian, image, program

1. Introduction

Different methods have been proposed for moving object edge detection. Gradient method is the most used edge detection method. In a case that is ideal enough, by the application of edge detection to an edge, image will bring out connected curves that point to the location between two areas of objects. In any tracking that involves video, moving object detection is an important task. Three steps are involved in almost all video detailing, these involve detecting the moving object, followed by tracking of the object from frame to frame and the last part involves recognizing the object's characteristics by analyzing it. This process can be affected by different interference obstacles such as change in illumination and variation of light.

To detect moving object, separation of the front object from the background in a sequence of video frame is important. Both pre and post processing are used to eliminate dynamic changes such as camera oscillations and background objects that are of high frequency. According to [1], the process of finding meaningful transitions in an image is referred to as edge detection, and it is useful to classify object. This edge detection depends on the order of pixel value derivatives. Gradient edge detection is the edge detection under first order derivative operator, and this first order derivative operator is not insensitive to noise, and thicker edges are produced by it. More sophisticated method for automatic edge detection is second order derivative operator which is also not insensitive to noise, example is difference of Gaussian. Since the result of the difference between the converted images to Gaussian blur images amplifies noise, prior to the application of Laplace, smoothing is advised [1].

For moving object detection, different objects are formed, among which are subtracting background, differentiating frames and so on. These methods are with one disadvantage or another. In background subtraction for example, the difference between a reference frame and the current frame is referred to as logic. This method is not suitable where there is illumination instability. The

objective of this paper is to detect an object with the use of Open CV python algorithm modules.

2. Related Works

More than twenty years, advancement in artificial intelligence branch called visual pattern recognition has resulted to numerous effective biometric applications visual enough for the identification of individuals using different methods such as finger prints [2]. As long as process of identification depends on matching of visual patterns, this makes it non-invasive compare to other methods that involve incision and puncture. Accordingly, the application of this biometrics on objects have proved a success just because the technology only made use of the physical characteristics posses by such objects with no room for invasive techniques, thereby yielding a vast merit in terms of suitability and security. Matching of visual pattern is a great effort that does not only allow the identification and recognition of individual objects, but helps in the object classification, occurrence detection and changes in behavioral attributes. Throughout history, scientists and researchers have made use of different methods to detect and identify different objects especially animals [3]. All these are efforts made toward what the situation becomes today, and there are more than one million reasons why research that involves detection and identification of objects cannot be easily exhausted. Taking for example, animal as an object has different species, and the species also come with unique patterns that involve advance recognition algorithm for identification.

Traditional method of identifying objects is a lot tedious notwithstanding earlier studies provision of unique methods for objects identification. Much contributory effort involvement from human expert having specialized skills makes the process of identification vulnerable to prejudice. Furthermore, traditional method of processing images becomes costly as the number of images increases. With the advent of techniques brought on by

machine vision to detect and locate the position of object [4], scientists and researchers have got the chance to consistently employ pattern matching methods to automatically monitoring objects. Identification of objects is necessary for so many reasons; for verification of claim of ownership, to substantiate justice, and securing life and property. There is need to provide a new method of identifying objects because lots of image processing tasks could no longer be taken care of by the existing tracking algorithms that are provided for identification purposes. This papers objectives is to provide a novel method of detecting and identifying object either static or on motion.

3. Methodology

The main algorithm used for this work is made up of the following (Fig. 1): save the initial image (image without object) and subsequent object’s images in a frame, convert the image to Gaussian blur image, calculate the difference, define a threshold to remove the shadows and other noises, add the rectangular box around the object, and calculate the time when the objects appears and exits the frame. The difference of Gaussian filter is got by finding the difference of two Gaussian functions [1]. This is calculated by the

application of two Gaussian operators with different values of σ to an image and their differences generated smoothed images. The expression of Gaussian’s difference is

$$a(b, c) = a_1(b, c) - a_2(b, c) \tag{1}$$

Where $a_1(b, c)$ and $a_2(b, c)$ are two Gaussian functions give by

$$a_1(b, c) = e^{r^2/2 \sigma_1^2} \tag{2}$$

$$a_2(b, c) = e^{r^2/2 \sigma_2^2} \tag{3}$$

Where $\sigma_1 > \sigma_2$

From eqns. (1), (2), and (3)

$$a(b, c) = \frac{r^2}{e^{2\sigma_1^2}} - \frac{r^2}{e^{2\sigma_2^2}} \tag{4}$$

It is clear by this condition that the result by using difference of Gaussian filter method is the complete contour of object with minimum calculation.

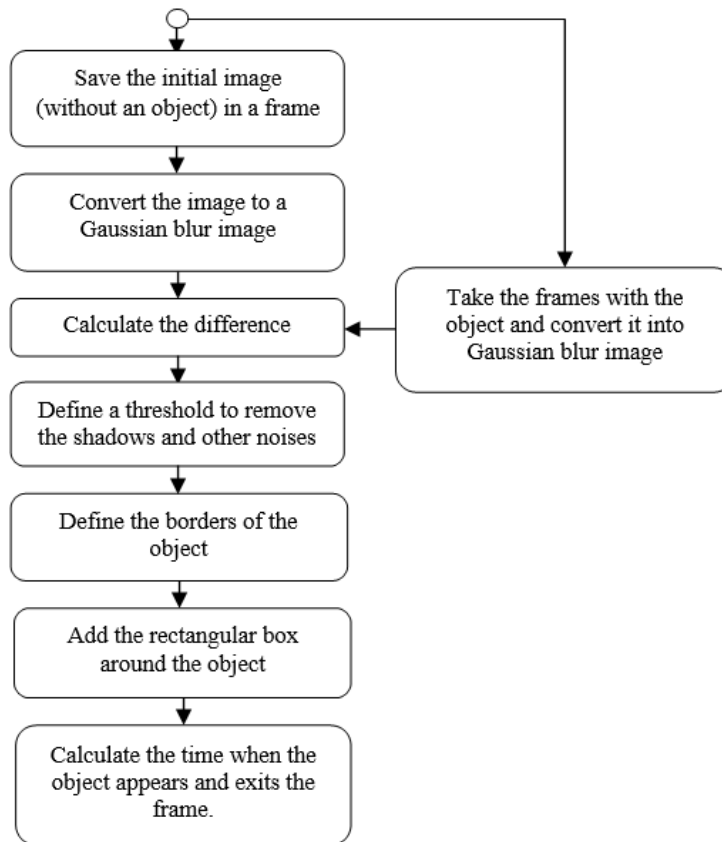


Fig 1: Flow chat of the main algorithm

4. Results and Discussion

This section presents the results got from the application of the algorithm iterated in the flow chat. From the initial stage when an object is sighted

In front of camera to the exit time (Fig. 2), and the different images generated during this experimental conduct plus the actions carried out on the image (s) from frame to frame to detect the target image are discussed in this section.

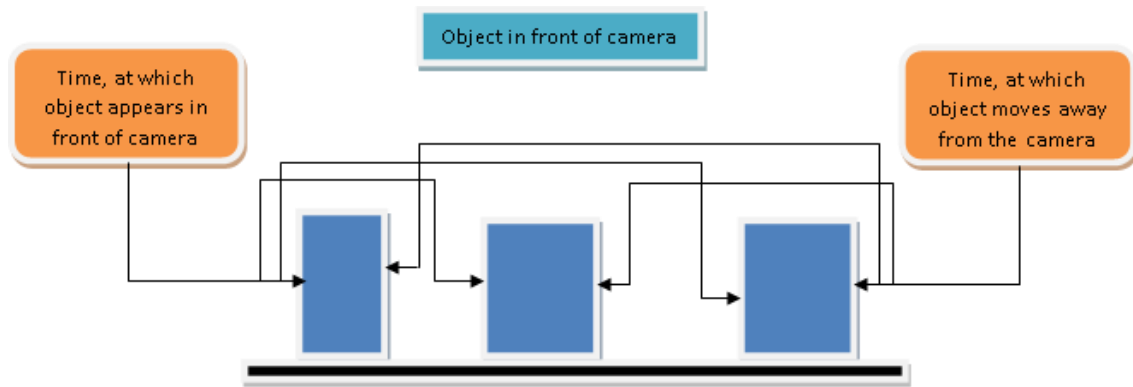


Fig 2: Framework of time of appearance & disappearance of object in front of camera

4.1 Saving the Initial Image (Image without Object)

This stage saves the initial image of the frame without object and subsequent frames with the object before it proceeds to the next step. For motion detection, a Video Capture object is created to record video using webcam. The structure for that is `video = cv2.VideoCapture(0)`. Convert the frame color (Fig. 3) to gray scale (Fig. 4) using the structure `gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)` and convert the gray scale frame to Gaussian Blur (Fig. 5) using `gray = cv2.GaussianBlur(gray, (21, 21), 0)`, which is the next step. The difference between the first frame and the other frames is calculated using the structure `delta frame = cv2.absdiff(first frame, gray)`.

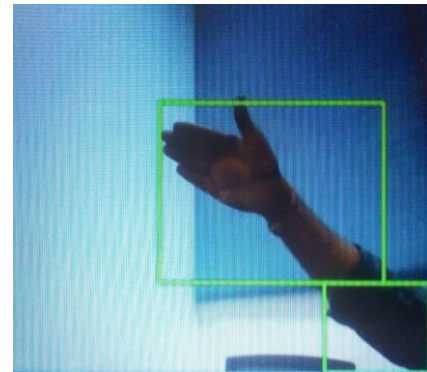


Fig 3: Screen shot of: Color frame

4.2 Define the Threshold to Remove the Shadows and other Noises

This stage provides a threshold value, such that it will convert the difference value with less than 30 to black. If the difference is greater than 30 it will convert those pixels to white. This is defined using the combined structure `thresh delta = cv2.threshold(delta frame, 30, 255, cv2.THRESH_BINARY)(1)` and `thresh delta = cv2.dilate(thresh delta, none, iteration=0)` (Fig. 6). Then, the contour area is defined by basically adding the borders. The shadows and the noises are removed basically keeping only that part white that has area greater than 1000 pixels. Then create a rectangular box around the object in the frame. After all these steps, the frame will change in 1 millisecond with the structure `key = cv2.waitKey(1)`. To store the time values, a Data Frame will be created to store the time values during which object detection and movement appears. At the beginning of the recording status is zero as the object is not visible. The list of status for every frame is stored and the date time is recorded in a list when change occurs. The Data Frame is written to a CSV file. The code used in this work is written in python using Open CV. Application of difference of Gaussian method is for the purpose of getting edges, this is to facilitate better computation method. Shown in Fig. 4 and Fig. 5 are the frames in a video at gray level and Gaussian blur level for finding the presence of moving object detection. Applicable only for gray scale images is gradient edge detection.



Fig 4: Screen shot of gray frame



Fig 5: Screen shot of Gaussian blur frame

One of the main advantages of difference of Gaussian for edge detection is the ability to use it for both gray frame (Fig. 4) and color frame (Fig. 5).

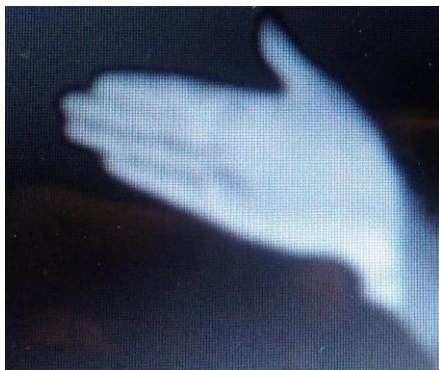


Fig 6: Screen shot of delta frame

Gaussians filter helps in filtering noise in the difference of Gaussian method. Figures 7a to 7e are screen shot of motion graph oscillations that illustrate for how long the object was in front of the camera. The graph, shot by shot contains the time result for how long the object was in front of the camera. The readings of the time it takes the object to appear and disappear from the front of the camera read between 34 secs and 46 secs, all frames inclusive. Each image interval from each other is calculated and the readings sequentially cover the entire frames in milliseconds as shown in the Figures (7a to 7e). These readings show great processing speed and accuracy of this algorithmic method.



Fig 7a: Screen shot of the motion graph oscillation

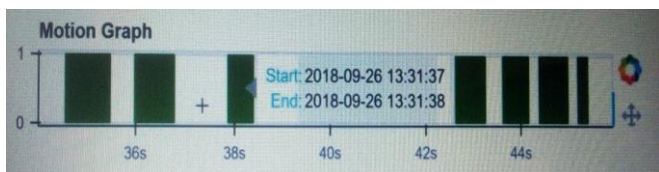


Fig 7b: Screen shot of the motion graph oscillation

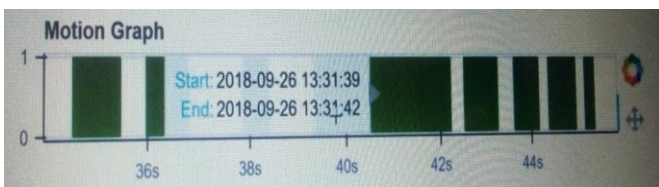


Fig 7c: Screen shot of the motion graph oscillation

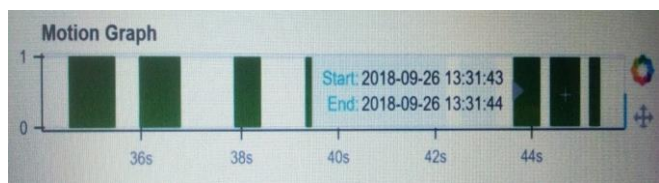


Fig 7d: Screen shot of the motion graph oscillation

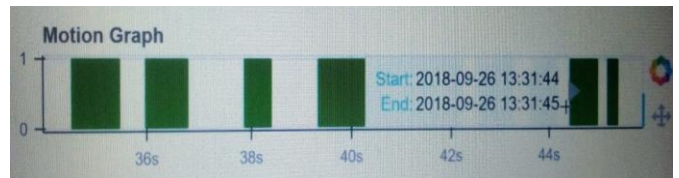


Fig 7e: Screen shot of the motion graph oscillation

5. Conclusion

This work is a novel effort on webcam to detect the motion or any movement in front of it. Presented in the paper is the automatic detection of object either in motion or static in web camera with a returned graph that contained for how long the object (here human feature) was in front of the camera. From the graph generated, each frame on the graph showed the appearance and exit readings when object was placed in front of the camera. The differences are in milliseconds, showing great processing speed and accuracy on the part of the algorithm and method used.

In addition, every traceable object in an image cannot be easily detected traditionally unless some modern digital applications are employed; images are in frames and objects are in images. So, previous methods of detecting objects in images are cumbersome, slow in speed, and inaccurate. In this work, though, human feature was used; our algorithm showed that, by the Gaussian blur conversion of the images and by finding the difference existing between the generated Gaussian images, objects can be detected accurately with speed without being affected by any background patches.

The research work is a work in continuity as research in detecting and identifying objects speedily and accurately especially animals (our future interest of application) cannot be totally exhausted.

6. Acknowledgment

Special thank you goes to Edureka for virtually made available some of the materials used in this paper.

7. References

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