Analysing Saliency with SIFT for Intruder Detection

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Abstract:
In this paper we are proposing a system for the colored saliency detection for securing the systems from indruders.The proposed system is based on saliency detection.The detection Saliency can be a good technique for the detection of Intruders in the security system areas.Saliency detection has become a very prominent subject for research in time.The different types of techniques has been defined for the saliency detection.the experimental results are shown in the below.

Keywords: Saliency detection, SIFT.

1. Introduction

Image Saliency is a part of image that can be captures the attention easily. Image detection of saliency is a active research topic in the field of image processing that can be detects the interesting part of image and captures the part of image salient to Human Visual System. Saliency detection is the subjected to detection of important regions in images which Human Visual System gets easily attracted. Human Visual System pays the uneven attention of image what they have seen. The image pay more attention on region containing an object than its surrounding regions, that region is called as salient region and detection of such regions is called as saliency detection. An image is normally represented by matrix of the pixels and saliency value of image is depending upon the saliency value of each pixel of the image. The working of saliency detection is extracting the salient objects in an image, assuming that there is one of salient ones within it. Salient object explains the visually attracted regions into the images. The saliency value is denoted by a number scaled to [0, 1] and that is shown in the gray image. The greater value the pixel has, the higher possibility or priority it is of being salient.

The models of visual saliency may be categorized into the these three stages:

- Extraction: To extract the features of vectors at locations over the image plane
- Activation: Form an "activation map" using the feature of vectors
- Combination: Normalization of the activation map.

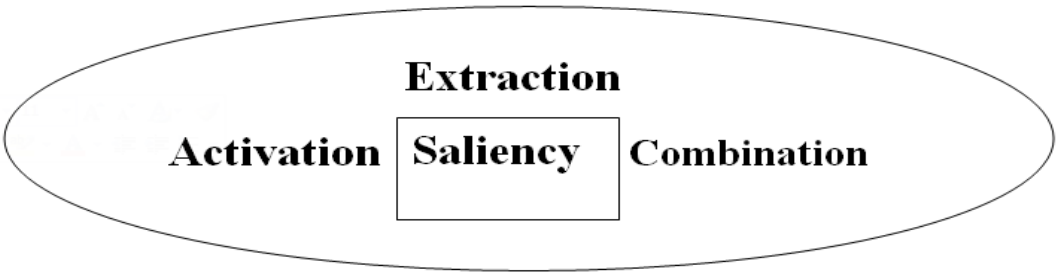


Figure-1 Saliency

1.1 Working of Saliency

Saliency of an image refers to spatial saliency which combines intensity,color and orientation information in order to generate a map of saliency.The saliency of videos is called spatiotemporal because it requires the temporal information that is added to spatial information[1].The image has the values that have the local variations in both of time and space. Saliency plays an essential role in visual attention detection.the eye system can see the large amount of eye information that is effectively in a very short interval of time[1].There has been an great increasing interest in extending of spatial saliency to the spatiotemporal saliency for the sequences of videos.

Structure of spatce and time saliency detection-The structure are as follows:
Temporal Restarting Distribution[2]-The temporal saliency features are motion distinctiveness, temporal consistency,and abrupt change.The temporal consistency is valid only when the adjacent frames contain same object of motion whose is not too fast between the frames.In simple words,the most similar patch, which is found within the constrained search range in the previous frame, may not be represent the current patch faithfully.
Spatial Transition Matrix[2]: The spatial transition probability matrix is used to employing the spatial feature.Specifically,in this a graph that is fully connec -ted constructed by taking of each patch.An intensity feature is defined as the average of red, green, and blue components for each pixel.Two color features are extracted based on the color.
Space and time Saliency Detection: To apply saliency detection,a restarting rule should be designed to determine a restarting distribution automatically[2].It obtained hierarchical saliency maps for a still image, by employing the saliency map at a coarse scale as the restarting[2] distribution of RWR at a fine scale.In this work,they develop an efficient restarting rule of RWR for the saliency detection of video sequences.

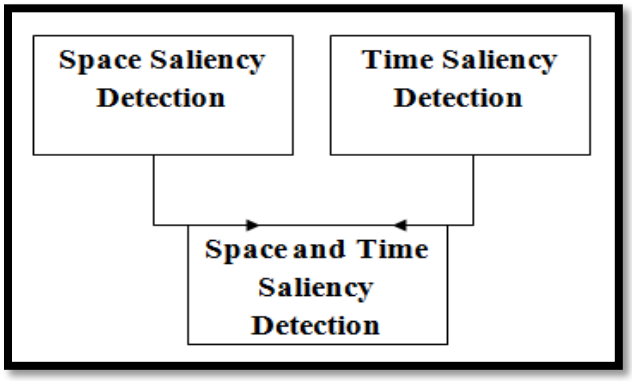


Fig.2 Block diagram of Space and time saliency detection.

1.2 SIFT(Scale-invariant feature transform)

The SIFT keypoints of the objects are first extracted from the set of images and stored into the database. An object is recognized in the new image by individually comparing each feature from the new image to this database and finding candidate matching features based on distance of

Euclidean their feature vectors. From the full set of matches, subsets of keypoints that can be its location, scale, and orientation in the new image are identified to the filter out of good matches.

SIFT includes four major stages[21]:

- Scale-Space Extrema Detection.
- Keypoint Localization.
- Orientation Assignment.
- Keypoint Descriptor.

Scale-Space Extrema Detection

The stage of the filtering attempts to identify of those locations and scales whose are identifiable from different views of same object.These can be efficiently achieved using a "scale space" function.It has been shown under the reasonable assumptions it must be based on the Gaussian of function.The scale space is defined by the function:$L(x, y, \sigma) = G(x, y, \sigma) * I(x, y)$ [25] Where * is the convolution of operator, $G(x, y, \sigma)$ is the variable-scale Gaussian and $I(x, y)$ is the input image. To detect the local maxim and minim of $D(x, y, \sigma)$ each point is compared with its neighbours at the same of scale, and its neighbours up and down one scale[21].

Keypoint Localistaion

This removes extrema with low contrast. To eliminate extrema based on localisation of poor it is noted that in these

cases there is a large principle curvature across the edge small of the curvature in the direction of the perpendicular in the difference of Gaussian function. If this difference is below the ratio of largest to smallest vector, from the Hessian matrix at the location and scale of the key point, the key point is rejected[21].

Orientation Assignment

The step main aims to assign a consistent orientation to the keypoints based on local properties of image. The keypoint describes that can be represented relative to this orientation, achieving invariance to rotation. The approach taken to find an orientation of image.

Keypoint Descriptor

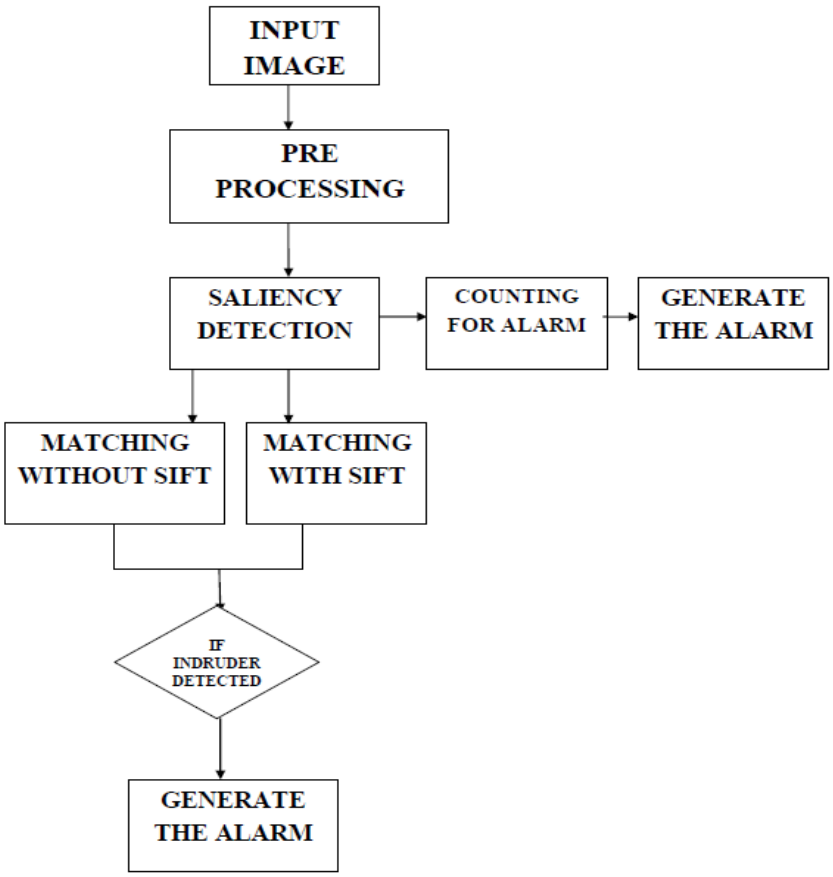
The local data of gradient is used to create keypoint descriptors. The gradient information is rotated to line up with the orientation [21] of the key point then that data is used to create a set of histograms over the window ofcentred on the keypoint.Keypoint descriptors typically uses a set of histograms which are 16,aligned in a 4x4 grid, each with 8 orientation bins,one for each of the main compass directions [21].

1.3 Indruder Detection

In Indruder detection we called a indruder to the object which is not saved in our database we used a indruder detection for the security of system.In the database we saved one or two objects for security purpose then we perform the colored saliency detection.In saliency detection we detects the object and extracts the colored based objects from image or video.then we match the object if extracted objected is matched then indruder is not matched and if exreacted object is not matched the indruder is detected and system generates the security alarm.

2. Proposed System Flow

The proposed methodolody in detail we explain in our research paper Securing Lockers at Religious Places Using Colored Saliency Detection which are in press [22].The block diagram diagram of proposed methodology are given below-



Figue-3 Block Diagram of Proposed System

A. **Input Image**- In this we take the image of objects from database.The input image is used to acquire an image from the databases.

B. **Pre-processing**-In this we use a conversion of type that converts RGB image into the grey scale image.to perform asaliency detection.

C. **Saliency Detecrtion-** In the we explain the working of saliency detection to detects an objects from the images and videos.In this we use the different types of saliency methods for the detection of an objects.In the saliency detection we performs the counting of objects to analyze the intruder and then generate the alarm when the counting is greater than to its limit.

D. **Matching without SIFT**-In this we perform the matching objects to detects the intruder in the system on the basis of matching percentage.

E. **Matching with SIFT-** In this we perform the matching objects to detects the intruder in the system on the basis of SIFT features.

F. **INDRUDER DETECTION-**In this if the indruder is detected the alarm is generated and not detected the alarm is not generated and then next overall complexity of a system is given.

3. Experimental Results

The experimental results are given below and we compare the overall timing of system,percentage of mateching with or without SIFT and indruder detection tables are as given-

1.Front View of an object with matching of saliency detection.

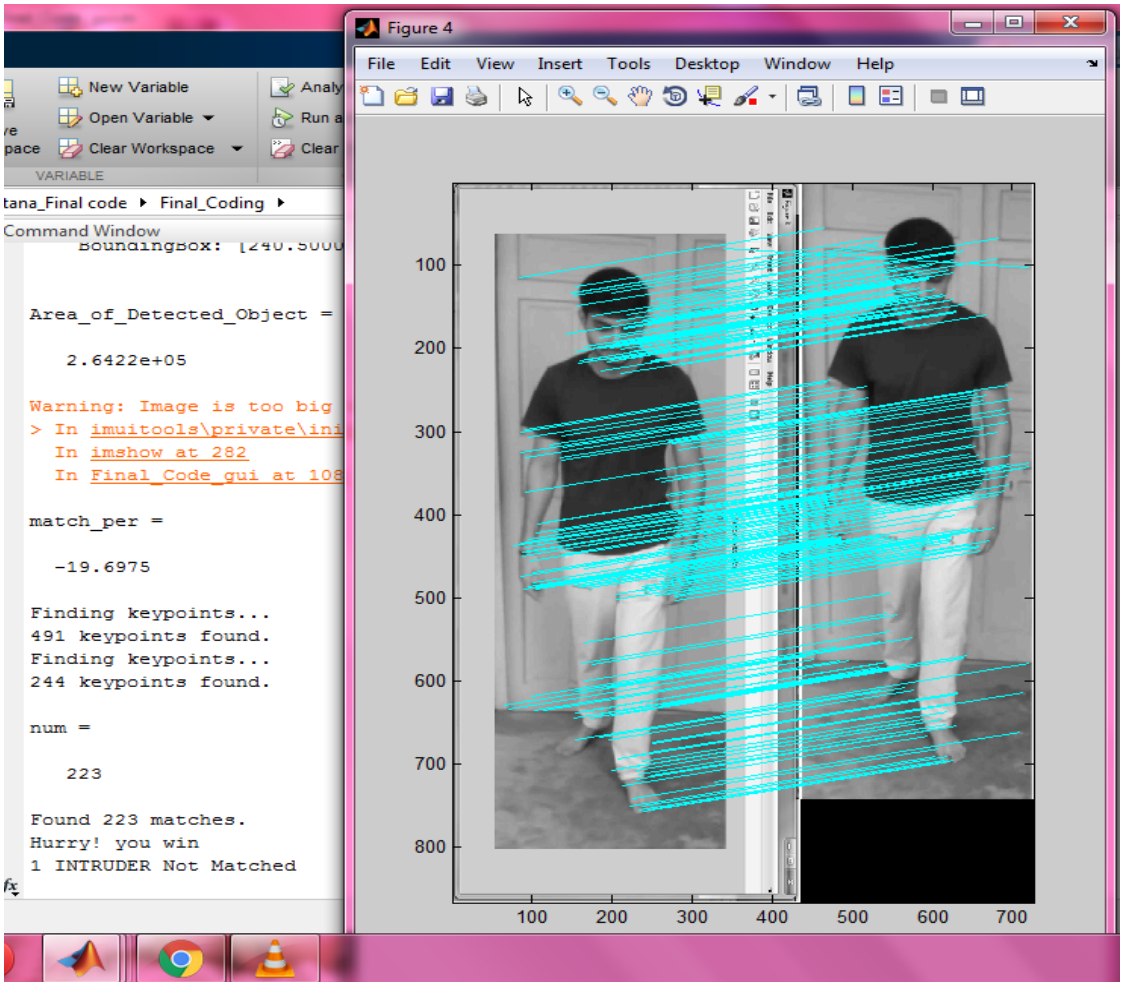


Figure-4 Matching of Objects with front view

2.Front View of one more object with matching of saliency detection.

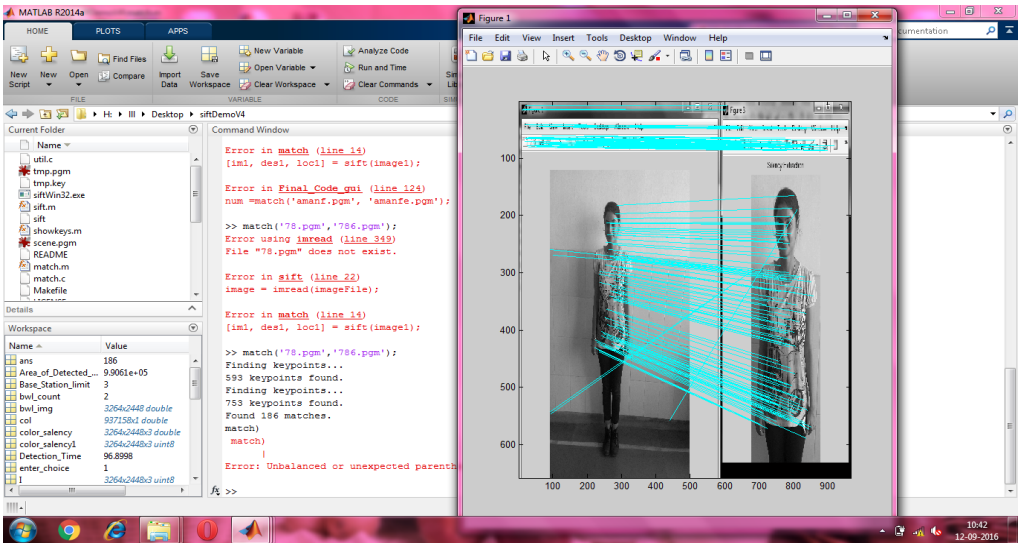


Figure-5 Matching of Objects with front view image

3.Right View of one more object with matching of saliency detection.

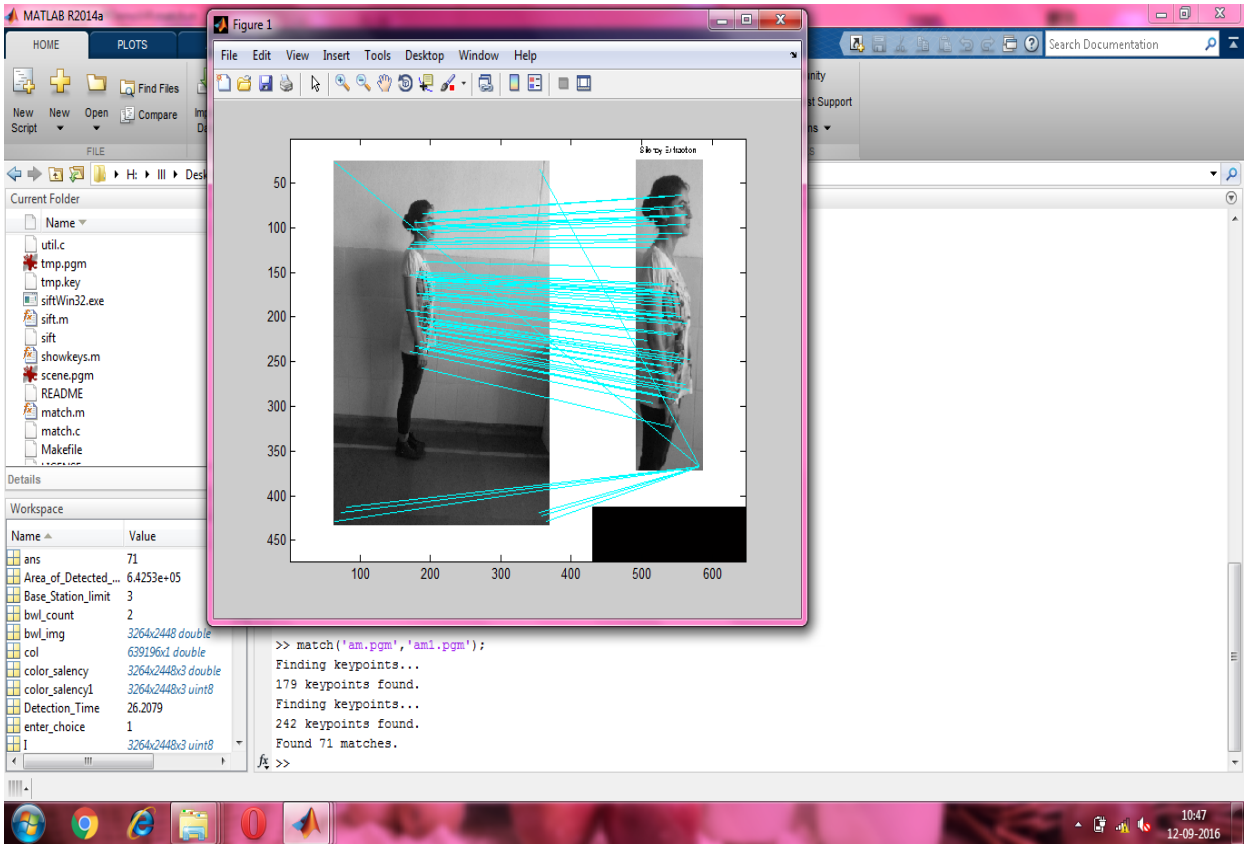


Figure-6 Matching of Objects with Right view

4.Left View of one more object with matching of saliency detection.

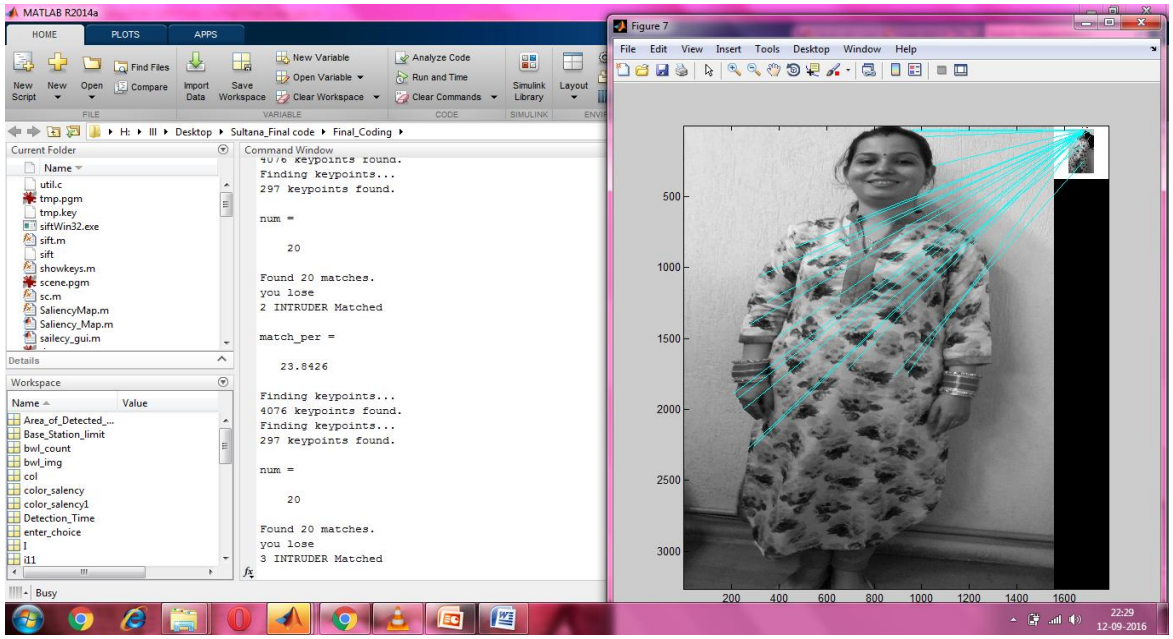


Figure-7 Matching of Objects with Leftt view

Comparison tables of saliency detection on the basis of Percentage of Matching, Overall Computation Time and indruder detection are given below-

Table 1- Percentage of Matching

Percentage of Matching			
Input	**Views**	**Matching with saliency without SIFT**	**Matching with saliency using SIFT**
Image 1	Front View	59.8686	593 K.F 593 K.F Match=593
	Left View	41.4424	593 K.F 192 K.F Match=3
	Right View	44.1648	593 K.F 242 K.F Match=1
Image 2	Front View	58.9887	4076 KF 548 KF Match=353
	Left View	32.9349	4076 KF 297 KF Match=20
	Right View	23.8426	4076 KF 336 KF Match=13

Table-2 Overall Computation Time

Overall Computation Time			
Input	**Views**	**Overall computation time with saliency**	**Overall computation time with saliency using SIFT**
Image 1	Front View	174.6717	178.6890
	Left View	35.4974	54.6820
	Right View	53.5673	50.9844
Image 2	Front View	57.6700	110.6413
	Left View	60.9838	150.0193
	Right View	138.7659	114.4459

Table-3 Indruder Detection

Indruder Detection			
Input	**Views**	**Indruder Detection**	**Indruder Detection using SIFT**
Image 1	Front View	NO	NO
	Left View	YES	NO
	Right View	YES	NO
Image 2	Front View	NO	NO
	Left View	YES	NO
	Right View	YES	NO

4. Conclusions

This paper presented a system for the security of systems from indruders. The experiment was conducted on the self take images. For the experiment, features of two persons who were allowed to enter the objects into the database firstly.The entry of an unknown person entered into the system, our system alarmed that ther's an intruder. In future, the system can be improved to work with neural networks of the images and videos.

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