

Review on Salient Region Detection via Different Techniques

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Abstract

Nowadays, Salient region detection is a critical problem in computer vision. It has a huge amount of applications, like object recognition, adaptive compression and segmentation. To detect salient regions many different approaches have been proposed. Visual saliency is which capture our attention is an important quality which makes an object, person, or pixel that relative to its neighbours. Bottom-up and top-down methods are used for visual saliency. Bottom-up salient region detection methods which is classify into uniqueness, compactness and background based.The uniqueness based method is addition of local and global contrast based techniques.The bottom-up salient region detection method is introduced that integrates compactness and local contrast cues. Furthermore, in order to produce a pixel-accurate saliency map which covers the salient objects output is propagated through the diffusion process.

Keywords: *Compactness, saliency map, Local contrast.*

1. Introduction

Saliency detection is a critical aspect in many of different applications containing salient object detection, salient object segmentation, content-aware image/video retargeting, content-based image/video compression and content-based image retrieval, etc. In human vision system, visual attention is an important mechanism which filters out redundant visual information and selects the salient objects which is nothing but the required portion of an image.

Visual attention which consist of two mechanisms that are stimulus driven and task driven these are also called as Bottom-up approach and top-down approach. The main goal of salient region detection is to completely highlight all object which are interested and adequately suppress background regions. Salient region detection output can be used for numerous vision problems which contains image segmentation, object recognition, image compression, content based image retrieval. Salient region detection is generally considered in computer vision as a process which contains two stages:

- 1) Detecting the most salient region.
- 2) Segmenting the accurate boundary of that object or region.



Fig 1: Salient Region Detection

By examination many of the bottom-up salient region detection methods depends upon the visual cues as well as it separate out the salient object from the background. It contain of different visual cues like uniqueness, compactness, background. Further, he uniqueness contains of local contrast and global contrast. So for finding required regions the salient region detection methods contains different cues like local contrast based methods, global contrast based methods, compactness based methods and background based methods.

For finding the contrast between image and its surrounding region the uniqueness based methods considers the low level features of image like colour, intensity and orientation. By examination the uniqueness based methods are further divided into two aspects that are local and global contrast based methods. In this the local contrast based methods which only consider the image regions with respect to their surrounding regions or local neighbourhoods as well as uniqueness of pixels or super-pixels. Here, this method uses local contrast as well as doesn't consider the global relation is used to highlight the salient object edges instead of uniquely propagating saliency to while salient object interior. The second one that is global contrast based methods estimate the saliency of individual image regions or pixels by using its contrast relations upon the complete image. But the global contrast based methods mostly depends on colour information as well as highlight the background regions as salient for images with which is not much colour variation between foreground and background.

Compactness based methods mainly concentrate on spatial variance of image. Commonly, pixels or

superpixels of image region contains small spatial variance in salient region and background. That will have more spatial variance that is distributed over complete image as well as have larger spread.

Background based methods instead of considering the contrast between the salient objects and as well as their surrounding regions it expose two general priors about backgrounds that are boundary and connectivity prior and consider both foreground and background cues in a different ways.

By graph-based ranking it ranks the similarity of the image elements which is pixels or regions with its foreground or background cues. Structuring of remaining paper is as follows. Section II focuses on related work for salient region detection. Section III provide methods used for salient region detection. Section IV concludes the paper.

2. Related Work

Many of the research on focuses on bottom-up salient region detection. By the survey bottom-up salient region detection methods can be classified into uniqueness, compactness, and background based. The uniqueness-based methods can be divided into two mechanism local and global contrast-based techniques.

Itti et al.[2] provided a local contrast based model, . For finding the contrast between image and its surrounding region the uniqueness based methods considers the low level features of image like colour, intensity and orientation. It uses the Gaussian based approach to develop model which is called as dynamic routing model. For computing the center-surround differences this information then used to define saliency.

Harel et al.[3] proposed Graph based Visual Saliency model. In this method, visual saliency models are divided into three different steps that are as in Extraction stage, the feature vectors are extracted from different location over the image plane. Secondly in Activation stage,to create activation map it uses the feature vectors from previous stage.

Finally in Normalization stage, by combining one or more activation maps into single map perform the normalization over activation map. In this graph based visual saliency model, this second and final stages are used to treat the equilibrium distribution over map locations as activation and saliency values as well as define edge weights on graphs.

Zhai and Shah [4] proposed, Global contrast-based methods estimate the saliency of individual pixels or image regions using contrast relationships upon the complete image. In this, using the contrast with all other pixels it computed pixel-level saliency. . But the global contrast based methods mostly depends on colour

information as well as highlight the background regions as salient for images with which is not much colour variation between foreground and background. In case of video sequences, it mainly focuses on human's first sight which is nothing but the salient region instead of surrounding neighbours. Here, it also have a spatiotemporal video attention detection technique which detects both objects that are we interested in and actions in video sequences. To produce final spatiotemporal attention model it combines both temporal and spatial features of saliency maps .In this method, Colour histogram is used which can be apply on several video sequences as well as many different images to detect the interesting objects and motions which are present in sequences with high satisfactory rate of user.

Achanta et al. [6] here, it present the results based on a frequency-tuned method, using the difference from the average image color which directly defines pixel saliency. It also provides a saliency map with well defined boundaries.

Goferman et al. [7] here, by concurrently modeling local low-level clues, visual organization rules, global considerations, and high -level features it highlighted salient objects with their contexts.

Cheng et al. [8] proposed a regional contrast-based saliency extraction algorithm, it is used to compute a saliency map. By considering the global region contrast over the whole image in the Lab color space as well as the spatial coherence.

Lang et al. [9] here it detected salient positions also determining the consistently sparse elements from the whole image.

Zhu et al. [10] proposed a tag-saliency model, according to the global contrast of low- and high-level information in the scene which is computing the probability that each over-segmented region is salient.

Gopalakrishnan et al. [11] Compactness based methods mainly concentrate on spatial variance of image. Commonly, pixels or superpixels of image region contains small spatial variance in salient region and background. That will have more spatial variance that is distributed over complete image as well as have larger spread. It only considered the low-level features in the background which have a larger spread than the salient regions. Here, it has a saliency region detection method which only considering colour and orientation that are two most important cues of image.

Perazzi et al. [12] gives a pixel-accurate saliency map concurrently exploiting color and position to rate a region's uniqueness and spatial distribution. Using high-

dimensional Gaussian filters these are formulated in a unified way.

Shi et al. [13] proposed a generic and fast computational framework called PISA, which contains spatial prior terms on the color and structure contrast measures, because of this the salient pixels are to be centered in the image and compact. By concluding that significantly it improved the effectiveness of the detection process.

Cheng et al. [14] considered that a spatially compact distribution which is another critical saliency indicator as well as cue to the contrast. To produce accurate salient region detection results they used the appearance similarity and spatial distribution of image pixels. It proposed a soft image abstraction approach, which captures large-scale which is homogeneous elements. It calculating global saliency cues.

3. Methodology

The bottom-up salient region detection methods can be classified into uniqueness, compactness, and background based. The uniqueness-based methods can be divided into two mechanism local and global contrast-based techniques

2.1 Local Contrast Based Method

In this the local contrast based methods which only consider the image regions with respect to their surrounding regions or local neighbourhoods as well as uniqueness of pixels or super-pixels. For finding the contrast between image and its surrounding region the uniqueness based methods considers the low level features of image like colour, intensity and orientation. In this method, visual saliency models are divided into three different steps that are as follows:

I. Extraction: In this step, the feature vectors are extracted from different location over the image plane.

II. Activation: To create activation map it uses the feature vectors from previous stage.

III. Normalization: By combining one or more activation maps into single map perform the normalization over activation map.

Here, this method uses local contrast as well as doesn't consider the global relation only used to highlight the salient object edges instead of uniquely propagating saliency to while salient object interior.

2.2 Global contrast based Method :

The second one that is global contrast based methods estimate the saliency of individual image regions or pixels by using its contrast relations upon the complete image. But the global contrast based methods mostly depends on

colour information as well as highlight the background regions as salient for images with which is not much colour variation between foreground and background. In case of video sequences, it mainly focuses on human's first sight which is nothing but the salient region instead of surrounding neighbours. Here, it also have a spatiotemporal video attention detection technique which detects both objects that are we interested in and actions in video sequences. To produce final spatiotemporal attention model it combines both temporal and spatial features of saliency maps. In this method, Colour histogram is used which can be apply on several video sequences as well as many different images to detect the interesting objects and motions which are present in sequences with high satisfactory rate of user.

2.3 Compactness based Method :

Compactness based methods mainly concentrate on spatial variance of image. Commonly, pixels or superpixels of image region contains small spatial variance in salient region and background. That will have more spatial variance that is distributed over complete image as well as have larger spread. It only considered the low-level features in the background which have a larger spread than the salient regions. Here, it has a saliency region detection method which only considering colour and orientation that are two most important cues of image.

2.4 Background based Method :

Background based methods instead of considering the contrast between the salient objects and as well as their surrounding regions it expose two general priors about backgrounds that are boundary and connectivity prior and consider both foreground and background cues in a different ways. The previous contrast based methods which generates saliency maps that are generally blurry, and small, purely local features.

4. Conclusions

In this paper, we survey so many methods for salient region detection. Many of the research on focuses on bottom-up salient region detection. Here, in this paper on bottom-up method which for detecting salient regions in images have two visual cues that are compactness and local contrast method. These both methods are complementary to each other after considering the advantages and limitations of different visual cues. Median filter is used to improve the quality. By compactness cues it incorrectly suppressed salient regions. But it doesn't give more efficiency.

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