A Detailed Survey on Saliency-Based Lesion Segmentation Detection and Classification Systems Based on Features and Classifiers

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ABSTRACT

This paper discusses the comparative study of Saliency-Based Lesion Segmentation Detection and Classification Systems Based on Features and Classifiers. Salient object detection is aimed at detecting and segmenting objects that human eyes are most focused on when viewing a scene. The segmentation of skin lesions in Dermoscopic images is considered as one of the most important steps in computer-aided diagnosis (CAD) for automated melanoma diagnosis. The main objective of a saliency map is to simplify and to change the representation of an image into something that is more meaningful and easier to analyze. The performance of the conventional system is evaluated by using the various images in the dataset and its performance is evaluated based on the parameters such as precision, recall, accuracy.

Keywords: Salient object detection; Segmentation; Classification; saliency map.
INTRODUCTION

Saliency is the ability or quality of a region in an image to standout (or be prominent) from the rest of the scene and grab our attention. Saliency can be either stimulus-driven or task specific. The former one is known as bottom-up saliency while the later specifies top-down saliency and leads to visual search. Bottom-up saliency can be interpreted as a filter which allows only important visual information to grab the attention for further processing. Saliency is a particularly useful concept when considering bottom-up feature extraction since one must find what is significant in an image from the scene data alone.

LITERATURE SURVEY

Shahzad Anver et.al\textsuperscript{1} proposed a novel method for saliency detection is to give clear features that form an input image are represented. A popular theory supports sparse feature representation, an image being represented with a basis dictionary having sparse weighting coefficient. Another method uses a nonlinear combination of image features for representation. They combine the two methods and propose a scheme that takes advantage of both sparse and nonlinear feature representation. To this end, they use independent component analysis (ICA) and covariant matrices, respectively. To compute saliency, A biologically plausible center-surround difference (CSD) mechanism is used. Our sparse features are adaptive in nature; the ICA basis function is learned at every image representation, rather than being fixed. They show that Adaptive Sparse Features when used with a CSD mechanism yield better results compared to fixed sparse representations. They also show that covariant matrices consisting of nonlinear integration of color information alone are sufficient to efficiently estimate saliency from an image. The proposed dual representation scheme is then evaluated against human eye fixation prediction,
response to psychological patterns, and salient object detection on well-known datasets. It is concluded that having two forms of representation compliments one another and results in better saliency detection Adaptive Sparse Representation. The input image is being simultaneously represented in sparse and nonlinear form. Then saliency is computed by local center surround operation and finally, both maps are combined to form a single saliency map. The drawback of this system is without any gradient or orientation information, a saliency model will fail to detect many salient regions.

Euijoon Ahn et.al\textsuperscript{2} presented a method in which the segmentation of skin lesions in dermoscopic images is considered as one of the most important steps in computer-aided diagnosis (CAD) for automated melanoma diagnosis. Other methods, however, have problems with over-segmentation and do not perform well when the contrast between the lesion and its surrounding skin is low. Hence, in this study, they propose a new automated saliency-based skin lesion segmentation (SSLS) that it is designed to exploit the inherent properties of dermoscopic images, which have a focal central region and subtle contrast discrimination with the surrounding regions. The proposed method was evaluated on a public dataset of lesion dermoscopic images and was compared to established methods for lesion segmentation that included adaptive thresholding; Chan-based level set and seeded region growing. Results show that SSLS outperformed the other methods in regard to accuracy and robustness, in particular, for difficult cases.

Ming-Ming Cheng et.al\textsuperscript{3} introduced a new method for Automatic estimation of salient object regions across images, without any prior assumption or knowledge of the contents of the corresponding scenes, enhances many computer vision and computer graphics applications. They introduce a regional contrast based salient object extraction algorithm, which simultaneously
evaluates global contrast differences and spatially weighted coherence scores. These saliency maps are further used to initialize a novel iterative version of Grab cut for high-quality salient object segmentation. They extensively evaluated the algorithm using traditional salient object detection datasets, as well as a more challenging Internet image dataset. The experimental results demonstrate that the algorithm consistently outperforms existing salient object detection and segmentation methods, yielding higher precision and better recall rates. It is also shown that the algorithm can be used to efficiently extract salient object masks from Internet images, enabling effective sketch-based image retrieval (SBIR) via simple shape comparisons. Despite such noisy internet images, where the saliency regions are ambiguous, saliency guided image retrieval achieves a superior retrieval rate compared with state-of-the-art SBIR methods and additionally provides important target object region information. In this work, saliency is determined as the local contrast of an image region with respect to its neighbors at various scales. The Saliency Cut algorithm provides another possibility for automatically finding the outlines of an object of interest on large scale image data sets. The drawbacks are the shape band model requires user sketch for further detection thus does not allow preprocessing and it needs a few minutes to process a single image making it unsuited for real-time image retrieval applications.

Ming-Ming Cheng et al. demonstrated a new method to identify salient objects in large image collections is essential for many applications including image retrieval, surveillance, image annotation, and object recognition. They propose a simple, fast, and effective algorithm for locating and segmenting salient objects by analyzing image collections. As a key novelty, they introduce group saliency to achieve superior unsupervised salient object segmentation by extracting salient objects (in collections of pre-filtered images) that maximize
between-image similarities and within-image distinctness. To evaluate this method, they construct a large benchmark dataset consisting of 15K images across multiple categories with 6000+ pixel-accurate ground truth annotations for salient object regions where applicable. In all the tests, group saliency consistently outperforms state-of-the-art single-image saliency algorithms, resulting in both higher precision and better recall. The algorithm successfully handles image collections, of an order larger than any existing benchmark datasets, consisting of diverse and heterogeneous images from various internet sources. The semantic isolated image deletion can effectively reduce the index size without impacting the retrieval precision in our experiments. Enforcing the semantic consensus among images on one index effectively saves storage without hurting the retrieval precision. The drawbacks are the scalability in terms of computational complexity and memory cost is utmost critical to image retrieval. The attributes obtained by multi-class recognition may reveal an image's rough high-level semantic contents, which is often complementary to the low-level descriptors.

Amir Reza Sadriel.al\textsuperscript{5} explained a new approach for the segmentation of skin lesions in dermoscopic images based on wavelet network (WN). The WN presented here is a member of fixed-grid WNs that is formed with no need of training. In this WN, after formation of wavelet lattice, determining shift and scale parameters of wavelets with two screening stage and selecting effective wavelets, orthogonal least squares algorithm is used to calculate the network weights and to optimize the network structure. The existence of two stages of screening increases globalists of the wavelet lattice and provides a better estimation of the function especially for larger scales. R, G, and B values of a dermoscopy image are considered as the network inputs and the network structure formation. Then, the image is segmented and the skin lesions exact boundary is determined accordingly. The segmentation algorithm was applied to
30 dermoscopic images and evaluated with 11 different metrics, using the segmentation result obtained by a skilled pathologist as the ground truth. Experimental results show that this method acts more effectively in comparison with some modern techniques that have been successfully used in many medical imaging problems.

Dicky N. Sihite\textsuperscript{6} focused a new technique for saliency extraction. Visual attention is a process that enables biological and machine vision systems to select the most relevant regions from a scene. Relevance is determined by two components: 1) top-down factors driven by task and 2) bottom-up factors that highlight image regions that are different from their surroundings. The latter is often referred to as "visual saliency." Modeling bottom-up visual saliency has been the subject of numerous research efforts during the past 20 years, with many successful applications in computer vision and robotics. Available models have been tested with different datasets (e.g., synthetic psychological search arrays, natural images or videos) using different evaluation scores (e.g., search slopes, comparison to human eye tracking) and parameter settings. This has made a direct comparison of models difficult. Here, they perform an exhaustive comparison of 35 state-of-the-art saliency models over 54 challenging synthetic patterns, three natural image datasets, and two video datasets, using three evaluation scores. It is found that although model rankings vary, some models consistently perform better. Analysis of datasets reveals that existing datasets are highly center-biased, which influences some of the evaluation scores. Computational complexity analysis shows that some models are very fast yet yield competitive eye movement prediction accuracy. Different models often have common easy/difficult stimuli. Furthermore, several concerns in visual saliency modeling, eye movement datasets, and evaluation scores are discussed and insights for future work are provided. Our study allows one to assess the state-of-the-art, helps to organize this rapidly growing field, and sets a unified
comparison framework for gauging future efforts, similar to the PASCAL VOC challenge in the object recognition and detection domains. One important element of this complex concert of neural processes is the mechanisms that drive visual saliency. This paper, therefore, attempts to frame the role of visual saliency in so far as it may contribute to the overall understanding of attention. All models achieved higher scores (all three) over the saccade test video clip, which is a circular moving blob on a static blue background. The drawbacks are the CC and NSSs cores suffer from the center-bias issue and their use in future model comparisons is not encouraged. There is still significant room to further improve attention accuracy due to a remaining large gap between model and human observer agreements.

Radhakrishna Achanta discussed a new method for detection of visually salient image regions is useful for applications like object segmentation, adaptive compression, and object recognition. Recently, full-resolution salient maps that retain well-defined boundaries have attracted attention. In these maps, boundaries are preserved by retaining substantially more frequency content from the original image than older techniques. However, if the salient regions comprise more than half the pixels of the image, or if the background is complex, the background gets highlighted instead of the salient object. In this paper, they introduce a method for salient region detection that retains the advantages of such saliency maps while overcoming their shortcomings. This method exploits features of color and luminance is simple to implement and is computationally efficient. They compare the algorithm to six state-of-the-art salient region detection methods using publicly available ground truth. This method outperforms the six algorithms by achieving both higher precision and better recall. They also show the application of our saliency maps in an automatic salient object segmentation scheme using graph-cuts. They use a similar approach, however, instead of the user indicating the background and
foreground pixels using scribbles, they use the saliency map to assign these pixels automatically. This method exploits features of color and luminance is simple to implement and is computationally efficient. The drawbacks are Computational time is high. And there is a complexity in the algorithm.

P.Y. Yin et.al\textsuperscript{8} proposed novel technology for image segmentation. Relevance feedback (RF) is an interactive process which refines the retrievals to a particular query by utilizing the user’s feedback on previously retrieved results. Most researchers strive to develop new RF techniques and ignore the advantages of existing ones. In this paper, they propose an image relevance reinforcement learning (IRRL) model for integrating existing RF techniques in a content-based image retrieval system. Various integration schemes are presented and a long-term shared memory is used to exploit the retrieval experience from multiple users. Also, a concept digesting method is proposed to reduce the complexity of storage demand. The experimental results manifest that the integration of multiple RF approaches gives better retrieval performance than using one RF technique alone and that the sharing of relevant knowledge between multiple query sessions significantly improves the performance. Further, the storage demand is significantly reduced by the concept digesting technique. This shows the scalability of the proposed model with the increasing size of the database. The IRRL model automatically chooses the best RF approaches at various feedback iterations for a given query. The user is not required to provide an explicit description of the target which is instead computed by the system. The drawbacks are the IRRL method is prohibitive learning time and storage requirement. This navigation pattern cannot a relevance feedback technique to retrieve most relevant videos, images from multimedia data according to user requirement.
CONCLUSION:

In this work, various existing methods for salient object segmentation is discussed in detail. The future work of my paper mainly concentrates on histogram-based contrast method (HC) to measure saliency. HC-maps assign pixel-wise saliency values based simply on color separation from all other image pixels to produce full resolution saliency maps. We use a histogram-based approach for efficient processing while employing a smoothing procedure to control quantization artifacts. Although the system can efficiently compute color contrast by building a compact color histogram using color quantization and choosing more frequent colors, the quantization itself may introduce artifacts.

REFERENCES


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