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A Novel Saliency Detection Framework for Effective Saliency Measurement

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Abstract—Salient objects are portions of an image or a video which are likely to be get noticed first when it is viewed by a person. The human vision system (HVS) of a human being has the ability to notice the most salient regions from a video or image. It enhances this ability by using the inherent visual attention mechanism. Here in this work, tries to simulate a model of the HVS of a person, that is a saliency model. For an effective saliency detection here in the proposed work integrated the concept of diffusion based compactness and local contrast. Compactness and Local contrast can enhance the efficiency of a saliency detection model. Moreover, the concept of superpixel generation is also implemented in this saliency model.

Keywords— Saliency, Compactness, Local Contrast

I. INTRODUCTION

The human vision system of a person has the capability to identify objects even from a complicated image. This is done by utilizing the inherent vision attention mechanism. Salient regions are portions which are likely to be noticed first when an image or video is seen by a person. Saliency models are implemented for simulating the human vision system. There are many saliency models have been introduced. Every model has its own features and limitations. Each models differs in using characteristics for saliency detection. Here, we proposes another saliency model which is more efficient and this model utilizes features like compactness and local contrast of an image for generating saliency map.

The proposed work is intended for the use in videos. First the input video is converted into a high quality video by using the superpixel conversion method. Then this superpixel video is converted into frames and the proposed saliency model is applied. Comparatively a faster superpixel conversion algorithm is used in this work. It is simple and generic. The performance of segmentation can be increased by using the capability of this superpixel algorithm. The main parameter in this work is k which is the required number of pixels having the same size. The contributions of this article are summarized as follows. Section 2 explains the related work. In section 3, gives the description about the saliency model using features of an image like compactness and local contrast. Section 4 is the conclusion of the paper.

II. RELATED WORKS

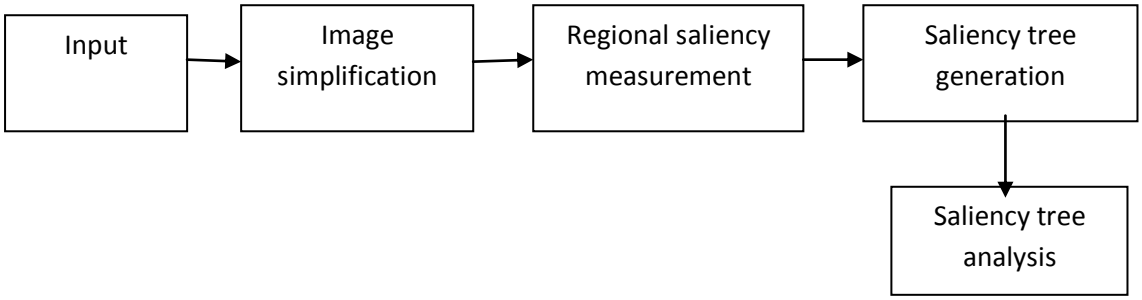
In computer vision, salient region detection is a highly discussed topic and it is a challenging problem. The salient region detection methods concentrates on highlighting the most striking objects and thus suppressing the background regions. The applications of saliency detection can be implemented on image segmentation, object recognition, salient object detection and segmentation [6]-[9]. The most related works to our saliency model are [1] [2].The work [1] proposes a saliency model which is named as saliency tree. In that work, they are integrating three measures, global contrast, spatial sparsity and object prior to find the saliency. Further, this approach has its own limitations on finding saliency most accurately. Other previous works regarding saliency detection are listed below.

Our work is a local contrast method. There are several other local contrast methods already published. One of the very first local contrast methods is presented in the work [4].In this work, for extracting intensity, orientation and multi-scale color information from images, a difference of Gaussians approach is used. After calculating center-surround differences, the details is then used to determine the saliency. In another paper [10] proposed a new method for finding saliency maps using an different local contrast analysis. They generated saliency map by utilizing a fuzzy model, before this for each pixel they computed the center surround color differences. A graph dependent visual saliency model for mixing the local unique maps from different channels is proposed in the paper [11].In another paper, saliency detection based on location is proposed, it is done by finding out the difference between the log spectrum characteristic and its nearby local average.

Compactness based methods can ensure good results on saliency detection. Gopalakrishnan presented a paper [12] which describing a robust salient region detection method, it is based on the different features of images like color, orientation and finally using a compact assumption selected a saliency map by utilizing the least spatial variances. Shi et al [13] implemented a new framework called PISA which is comparatively more generic and fast.

III. SALIENCY MODEL

The model for detecting saliency in images and video proposed in this work is developed through different steps. Those steps are image simplification, regional saliency measurement, saliency tree generation and finally saliency tree analysis. A simple diagram representing the working of this model is given below.



The concept of local contrast and compactness is also included in this work. By working using those measures we can generate a more efficient saliency map of inputs than the existing salient object detection models. First of all, using the superpixel segmentation algorithm, the input we given to our model is filtered out in-order to generate the superpixel graph. After that, this graph is undergone through a diffusion process to generate separate saliency maps for diffusion based compactness and diffusion based local contrast. Finally those two maps are merged together to form the final effective saliency map.

IV. RESULTS

The result of our work is a saliency map which highlights the most salient regions in the input image or video. The figures showing the result are given below. Saliency maps generated using our model ensures more effective performance than the existing models. A comparative study can be done for analyzing this by the use of various image datasets.

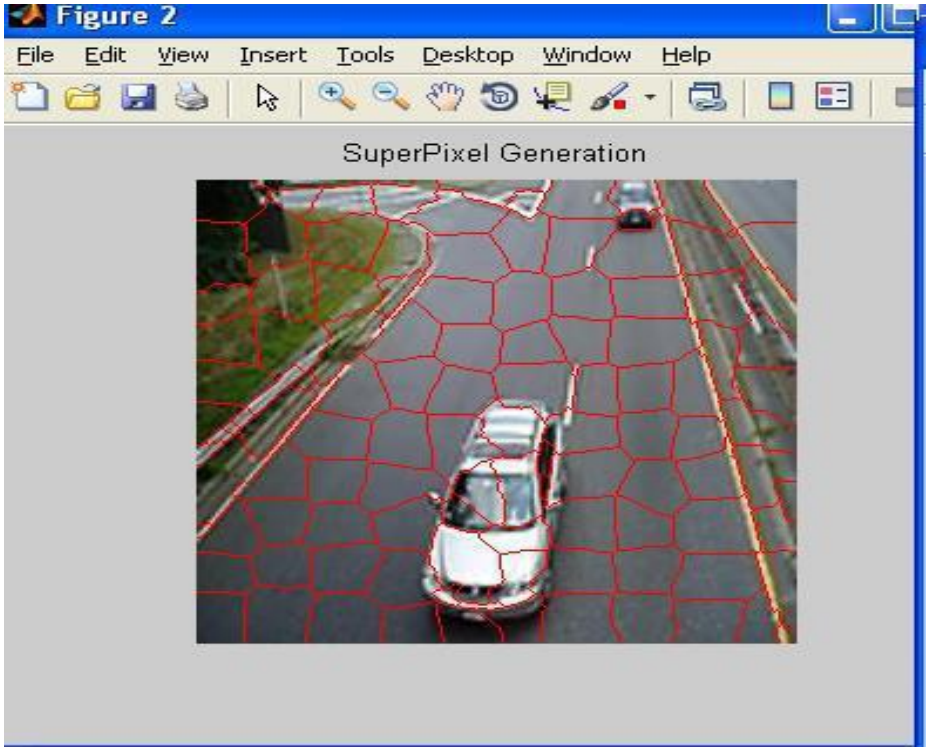


Figure 1 : Superpixel generation of input

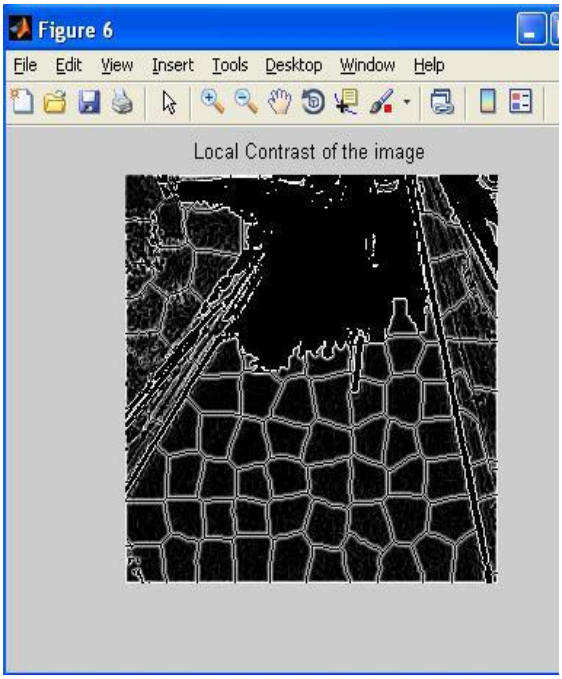


Figure 2 : Local contrast

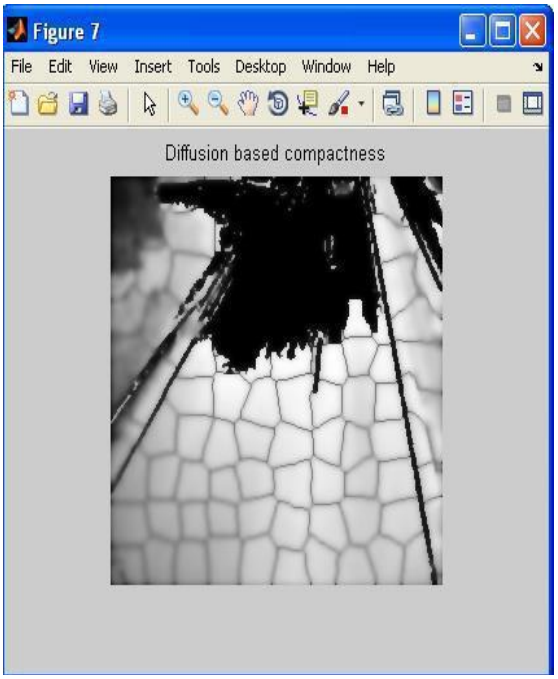


Figure 3 : Compactness

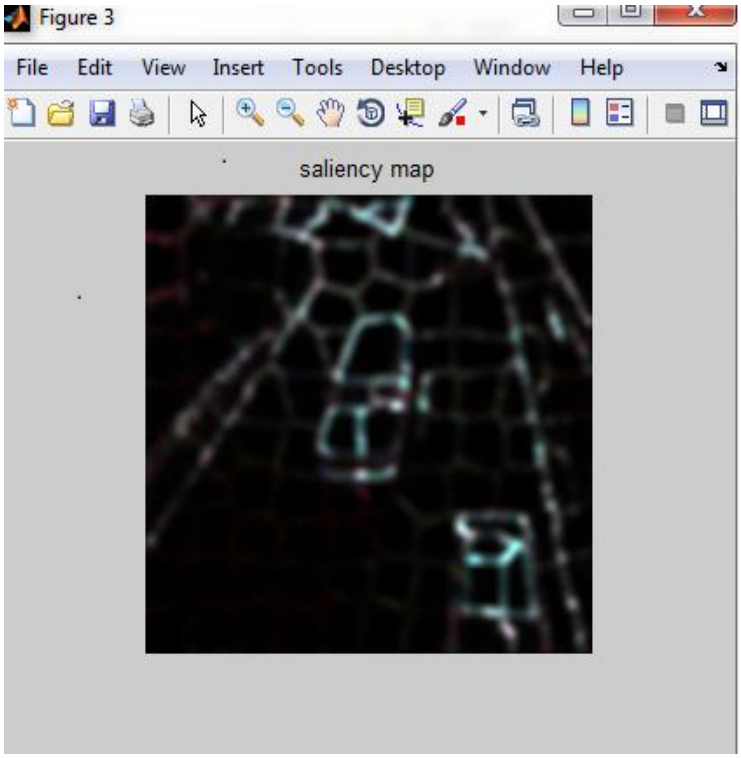


Figure 4 : Saliency map

V. CONCLUSION

This paper proposes a saliency model that effectively highlights the most salient regions. Here this saliency model follows a local contrast method. Saliency regions in the video or image input are highlighted by integrating compactness measure and local contrast measure using diffusion processes. Those two measures are complementary to each other. The advantage of local contrast is that, it can efficiently highlight the salient region with the help of the compactness measure. After the saliency detection processes, the result is undergone through a diffusion process in-order to generate a pixel wise quality saliency map. Also we are increasing the quality of the video input by using superpixel method. This saliency model can be used for different applications like salient object detection or segmentation, content based image retrieval etc..

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