SALIENCY MAP BASED IMPROVED SEGMENTATION

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ABSTRACT

In this paper we present a novel approach for refining segmentation using saliency map. To achieve this, we first develop a new saliency detection method based on cues at various levels. Initially preprocessing step is done using non-linear anisotropic diffusion filtering in order to preserve the edge information in the foreground salient objects and smoothen the background. Then we apply grab cut segmentation using saliency map as the input to get improved segmentation. Repeated application of the scheme is used for multi-object segmentation. The experimental results for the saliency technique show high precision and recall rates against the state-of-the-art methods.

INTRODUCTION

Saliency is a measure of the most conspicuous region or object which stands out distinctly in an image. Attentional selection can be essentially viewed as saliency detection which is based on certain cues of the sensory information. These visual attention mechanisms can be driven by top down (memory-driven) or bottom up (memory-free) influences.

An object is characterized by a well defined boundary and its relative conspicuity against the background. Thus, saliency becomes an important property for segmenting objects. The improvement in the saliency map is made possible by fusion of various saliency cues at local, global and rarity level. Further, to increase the discriminability of the proposed saliency map, we apply an anisotropic diffusion filtering to the image.

FEATURE MAPS

Fig. 1. a) Original image b) Non-linear anisotropic diffusion filtered image c) Normalized color map d) Normalized intensity map e) Normalized orientation map f) Depth map g) Local features map

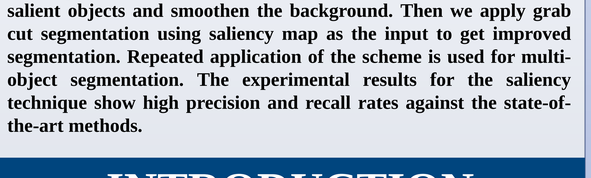

Fig. 2. a) Mean shift segmented image b) Global Contrast map c) Spatial Sparsity map d) Global features map e) PQFT rarity map f) Combined saliency map

RESULTS

ASD-1000 and SOD-300 database is used for experimentation. ASD dataset contains 1000 images from MSRA (Microsoft Research Asia) dataset. SOD dataset contains 300 images from BSD (Berkeley segmentation dataset).

Fig. 3. a) Original image (ASD) b) Saliency map c) Binarised saliency map d) Initial segmented image e) Original image (SOD) f) Ground Truth g) Saliency map

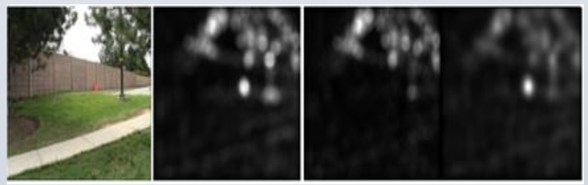

Fig. 4. a) Original image b) PQFT c) PFT d) PCT

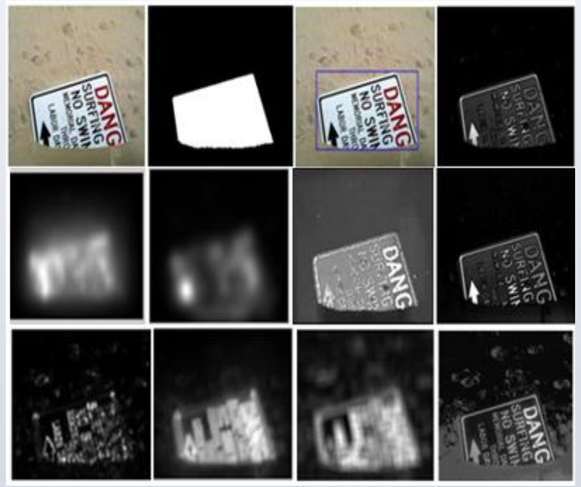

Fig. 5. a) Original image b) Binarised ground truth c) Ground truth label d) Maximum Symmetric Surround e) GBVS f) Itti-Koch g) Seg h) Frequency Tuned i) Hou j) Context Aware k) SUN l) Our Approach

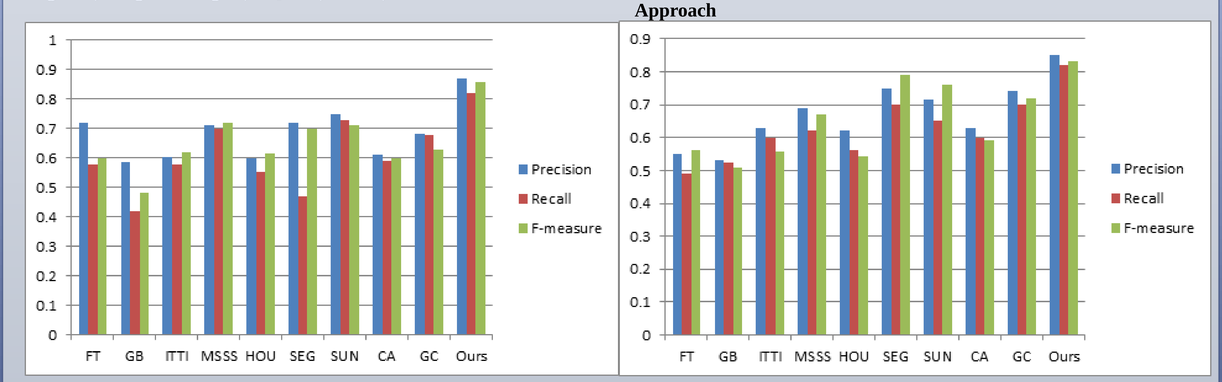

Fig. 6. Performance measures for a) ASD-1000 database b) SOD-300 database

REFERENCE

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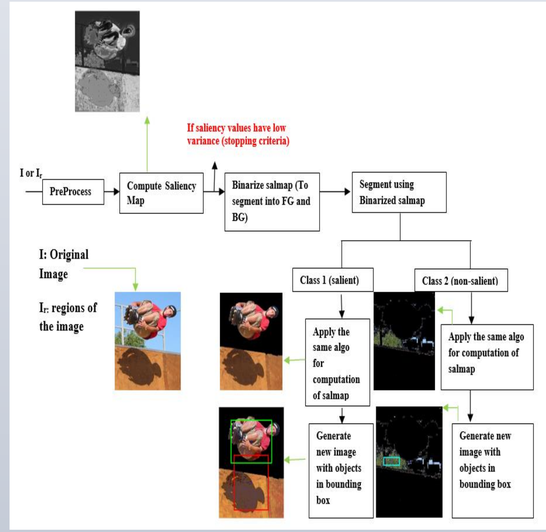
PROPOSED APPROACH

The scheme consists of the following steps:

1. Preprocess image using non linear anisotropic scale space filtering.
2. Compute the saliency map of the preprocessed image using the modified saliency map.
3. Obtain global variance of the saliency map.
4. If var>Threshold Goto step 5 else *Stop* no further segmentation of the region is possible.
5. Binarize the saliency map and use the two regions as initial input for grab-cut segmentation.
6. Apply bounding box to the two regions and generate two images, each containing the pixels lying within the bounding box.
7. Repeat for the two images generated in Step 6.



CONCLUSION

- **Better segmentation results, we use non-linear anisotropic diffusion filtering which substantially reduces the time complexity for computation of saliency map and improves the performance rates.**
- **Target multi-object segmentation using different levels of cues of saliency.**
- **The proposed saliency map technique gives relatively high results (precision and recall rates) compared to the prior state-of-the-art methods.**