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A Two Stage Approach to Detect Salient Objects in Noisy Images

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Salient Object Detection (SOD) has become an active research area in past two decades due to its critical applications in image segmentation, image compression, object discovery and video summarization *etc.* In literature, several methods have been proposed to detect salient objects in digital images. The main objective of salient object detection methods is to extract visually dissimilar areas in digital images which are free from any artifact e.g. noise. In this paper, we have proposed a novel two stage approach to detect salient object in noisy images. In the first stage, we have applied two-dimensional wiener filter to reduce noise affect in the image while in the second stage, features are extracted using Liu *et al.,* method. The effectiveness of the proposed approach is demonstrated on two publicly available datasets *viz.* ASD and MSRA5K. Experimental Results demonstrate that the proposed approach outperforms several other methods in terms of Precision, Recall, F-measure and Area-Under the Curve.

Keywords : Wiener, Noise, Multiscale, Two-Stage.

1. INTRODUCTION

Humans possess the capability of distinguishing visually distinguishing areas in an image without any training. These salient areas are distinguished based on the dissimilarity with the surrounding regions. Thus, more attention is paid by human beings to some parts of an image and may be termed as Salient Object Detection (SOD). The availability of computational power has made it possible for machine to find salient regions in a digital image. SOD has several applications in real life scenarios such as image and video compression [2], object detection and recognition [1], video summarization [3,4], image segmentation [5,6], object discovery [7,8], content based image retrieval [9] *etc.* Several methods for salient object detection have been proposed in literature. Pioneering work in the field of Salient Object detection has been done by Itti *et al.,* [10].

In their research work, a computational model was proposed which was inspired by the neural architecture in the visual cortex of the human beings. Itti *et al.,* [10] also suggested that SOD methods can be broadly divided into (a) bottom-up methods (b) Top-down methods. In bottom-up methods, low level image features such as intensity, color and and orientation *etc.*, are extracted for detecting salient objects in an image. On the other hand, in top-down models, salient objects are detected by incorporating the existing knowledge of the visual system of the human beings. Bottom-up models tend to be fast, saliency-driven and independent of the task at hand while top-down models tend to be slow, volition-controlled and dependent on task at hand [10].

A comprehensive survey of salient object detection methods has been carried out by Borji *et al.,* [11] and categorized the salient object detection methods into three categories viz. (a) Psychophysics (b) Computational Modelling (c) Neurophysiology . In computer aided salient object detection, mainly the second category models *i.e.*, computational models are employed. We further divide computaional models into (i) local (ii) global and (iii) hybrid models. Methods based on Local methods employ individual pixels to find salient objects

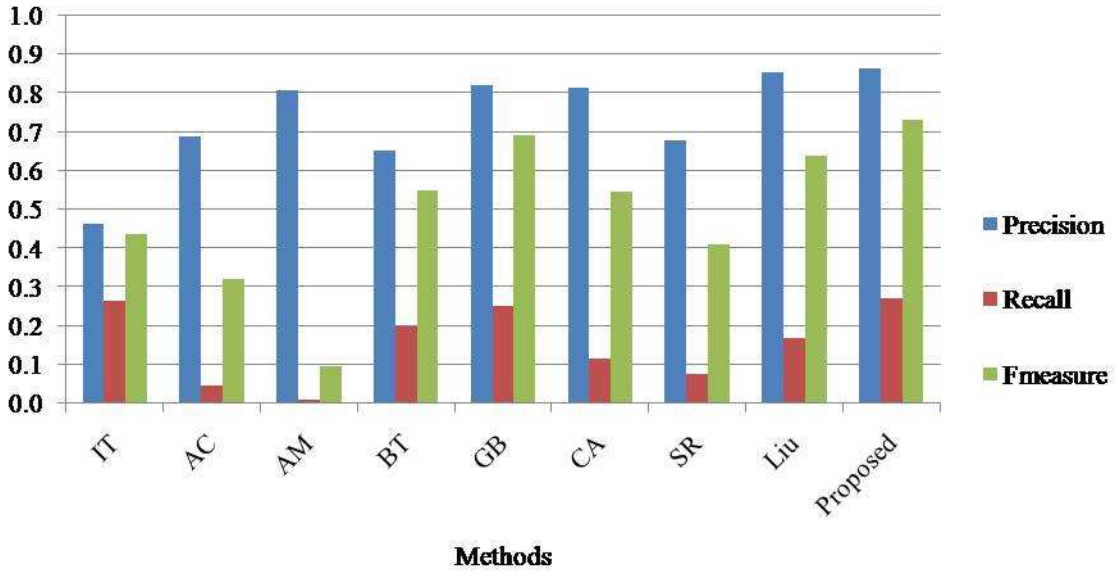

Figure 3. Bar Chart Corresponding to Table 1

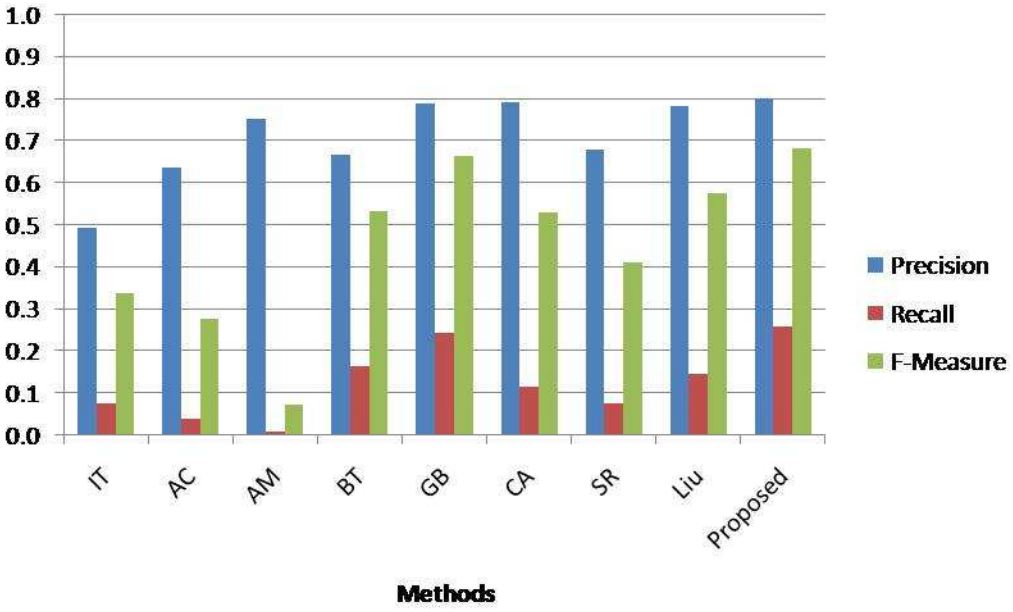

Figure 4. Bar Chart Corresponding to Table 2

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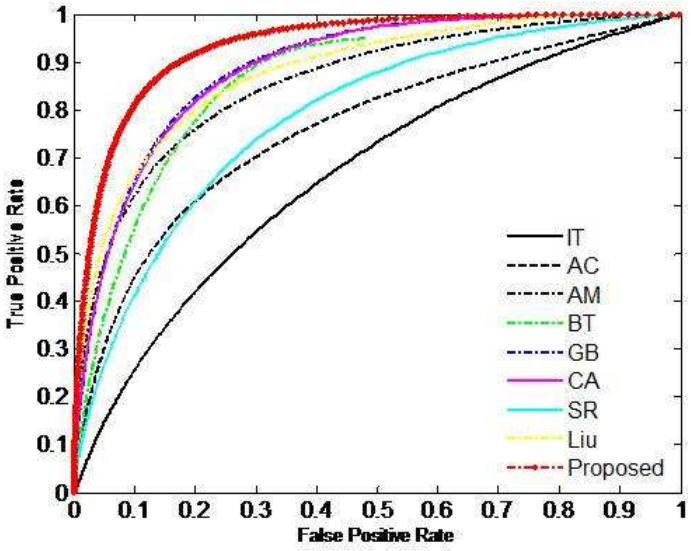

Figure 5. ROC Curve for the Compared Methods on ASD Dataset

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