

## A MODEL OF HIERARCHICAL ATTENTION FOCUSING BASED ON SALIENCY MAP AND ITS APPLICATION FOR A DISPLAY METHOD FOR SMALL MOBILE DEVICES

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**ABSTRACT.** *We propose a model of hierarchical attention focusing and its application to a display method for small mobile devices. In a previous paper [13] we pointed out that visual resolution is low when the attended area is broad and is high when the attended area is narrow. Then we proposed a model to obtain a saliency map that expresses a tendency to attract human attention [20,21]. Combining these, in this paper, we construct a model that controls attention movement, and which, in particular, predicts how attention is focused on an interest object. Based on the model, in this paper, we also propose a method to display a large-scale image on the small screens of small mobile devices, such as mobile phones. In this method, a region of interest (ROI) is detected using the saliency model, and the region is zoomed in as if attention were hierarchically focused on the region. Main novelty of this research is that there is a proposed method determines a sequence of ROIs based on a hierarchical attention focusing model. Since this sequence is expected to correspond to how human moves his or her attention successively, it is expected that when human see the generated sequence of images on a small display, he or she would easily enjoy it without sense of discomfort.*

**Keywords:** Visual attention, Region of interest, Hierarchical attention focusing, Mobile display, Saliency map.

**1. Introduction.** Images have become increasingly important in mobile communication. Since smart phones and PDAs (Personal Digital Assistants) have become more prevalent, people can access various multimedia data more easily. In keeping with this trend, new technology on image processing has been developed [1-3] as image coding, mosaics algorithm, watermarking and so on. Among them, we are here concerned with the problem that mobile devices have such small screens that people cannot fully enjoy high-quality images on them.

To solve this problem, several methods have been proposed [4-8]. Kimura and Yamaguchi [4] proposed a system that detects a region of interest (ROI) from a high-quality original image and displays the region on a small screen. In this method, the ROI is extracted based on bottom-up features of the input images, such as edges. However, the extracted region may not necessarily be important. Seo et al. [5] proposed a method to extract important regions as ROI. Their method was based on a domain-specific approach and was applied to soccer videos. Wang et al. [6] used a generic visual attention model to extract ROIs, and proposed a method to construct new video sequences for small displays based on the original videos and the extracted ROIs. Cheng et al. [7] proposed a method based on content recomposition, in which user-interest objects are extracted from original videos, and according to media aesthetics, are suitable reintegrated for video adaptation