Exploring Visual Attention Using Random Walks Based Eye Tracking Protocols

Xiu Chen, Zhenzhong Chen

PII: S1047-3203(17)30042-1
DOI: http://dx.doi.org/10.1016/j.jvcir.2017.02.005
Reference: YJVCI 1956

To appear in: *J. Vis. Commun. Image R.*

Received Date: 6 February 2016
Accepted Date: 10 February 2017

Please cite this article as: X. Chen, Z. Chen, Exploring Visual Attention Using Random Walks Based Eye Tracking Protocols, *J. Vis. Commun. Image R.* (2017), doi: http://dx.doi.org/10.1016/j.jvcir.2017.02.005

Exploring Visual Attention Using Random Walks Based Eye Tracking Protocols

Xiu Chen[a], Zhenzhong Chen[a]

[a]*School of Remote Sensing and Information Engineering, Wuhan University, China*

Abstract

Identifying visual attention plays an important role in understanding human behavior and optimizing relevant multimedia applications. In this paper, we propose a visual attention identification method based on random walks. In the proposed method, fixations recorded by the eye tracker are partitioned into clusters where each cluster presents a particular area of interest (AOI). In each cluster, we estimate the transition probabilities of the fixations based on their point-to-point adjacency in their spatial positions. We obtain the initial coefficients for the fixations according to their density. We utilizing random walks to iteratively update the coefficients until their convergency. Finally, the center of the AOI is calculated according to the convergent coefficients of the fixations. Experimental results demonstrate that our proposed method which combines the fixations' spatial and temporal relations, highlights the fixations of higher densities and eliminates the errors inside the cluster. It is more robust and accurate than traditional methods.

Keywords: eye tracking, visual attention, fixation, area of interest, Random Walks

1. Introduction

Optimizing user experience plays an important role in today's research and development of multimedia systems and applications. Exploring human visual systems is a key to understanding the human characteristics. Visual attention has attracted more and more research activities due to its applications in saliency detection [1, 2, 3, 4], object detection [5], image and video

Email addresses: chenxiu@whu.edu.cn (Xiu Chen), zzchen@whu.edu.cn (Zhenzhong Chen)