Eigenbackground revisited: can we model the background with eigenvectors? SUPPLEMENTARY MATERIAL

Mahmood Amintoosi*[1] and Farzam Farbiz[2]

[1]Faculty of Mathematics and Computer Science, Hakim Sabzevari University, Iran
[2]A*STAR Institute of High Performance Computing (IHPC), 1 Fusionopolis Way, #16-16 Connexis, Singapore 138632

***Abstract*—Using dominant eigenvectors for background modeling (usually known as Eignebackground) is a common technique in the literature. However, its results suffer from noticeable artifacts. Thus have been many attempts to reduce the artifacts by making some improvements/enhancement in the Eignebackground algorithm.**

In this paper, we show the main problem of the Eignebackground is in its own core and in fact, it is not a good idea to use strongest eigenvectors for modeling the background. Instead, we propose an alternative solution by exploiting the weakest eigenvectors (which are usually thrown away and treated as garbage data) for background modeling.

***Keywords*— Eigenbackground, Background Modeling, Background Subtraction, Principal Component Analysis, Gaussian Mixture Model, Video Analysis.**

I. Animated version of the last three figures of the paper

In the last 3 figures of the paper, we showed sub-spaces produced by 5 principal components' pairs. Hence 25 pairs are demonstrated as the animations, which works only on Adobe Reader ≥ 7.

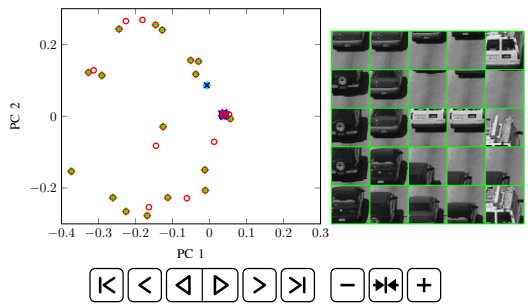

Fig. 9 (animated). Animated demonstration for the effect of different principal components for video: ***Highway***. (Left panel:) the principal components' sub-space of the video. The blue crosses/red circles, show background/foreground images. The green plus points are the closest projected images to the vertices of a unified grid, defined by the marginal of the principal components. (Right panel:) The images corresponding to the green plus points. Foreground images are well distributed in sub-spaces related to strongest eigenvectors (first eigenvectors); in contrast background frames are well propagated in sub-spaces corresponding to the weakest eigenvectors.

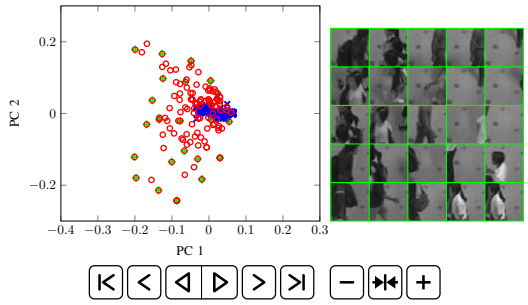

Fig. 10 (animated). Animated demonstration for the effect of different principal components for video: ***ShoppingMall***. (Left panel:) the principal components' sub-space of the video. The blue crosses/red circles, show background/foreground images. The green plus points are the closest projected images to the vertices of a unified grid, defined by the marginal of the principal components. (Right panel:) The images corresponding to the green plus points. Foreground images are well distributed in sub-spaces related to strongest eigenvectors (first eigenvectors); in contrast background frames are well propagated in sub-spaces corresponding to the weakest eigenvectors.

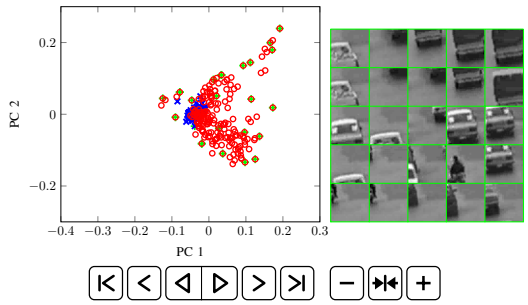

Fig. 11 (animated). Animated demonstration for the effect of different principal components for video: ***Traffic***. (Left panel:) the principal components' sub-space of the video. The blue crosses/red circles, show background/foreground images. The green plus points are the closest projected images to the vertices of a unified grid, defined by the marginal of the principal components. (Right panel:) The images corresponding to the green plus points. Foreground images are well distributed in sub-spaces related to strongest eigenvectors (first eigenvectors); in contrast background frames are well propagated in sub-spaces corresponding to the weakest eigenvectors.

m.amintoosi@hsu.ac.ir, corresponding author
Farzam_Farbiz@ihpc.a-star.edu.sg