

QR-Decomposition-Based Background Subtraction

M. Amintoosi^{1,2}, F. Farbiz¹, M. Fathy¹, M. Analoui¹, N. Mozayani¹

¹ Computer Engineering Department,
Iran University of Science and Technology, IRAN
mAminToosi@iust.ac.ir

² Mathematics Department,
Sabzevar Teacher Training University, IRAN, 397

Abstract. In this paper a new background subtraction algorithm based on QR-Decomposition has been proposed. Gaussian Mixture Model¹ has been used for modeling the background in many literatures. In the GMM method for background subtraction, background segmentation involves a binary classification problem based on $P(B|x)$, where x is the pixel value at time t , and B represents the background class. The posterior probability can be expressed in terms of the mixture components $P(G_k)$ and $P(x|G_k)$ and a density estimate $P(B|G_k)$. The estimation of $P(B|G_k)$, (or in other words distinguishing which kernel of GMM belongs to the background and which is that of the foreground) is one of the most concentrating aspects of background subtraction in the literatures. This problem is eliminated in the proposed approach with QR-Decomposition, a known method in Linear Algebra. In a sequence of frames in which the scene is not empty at any moment, each small block of background can be seen in some frames. The key idea of the proposed method lies in the identification of the background based on these blocks with QR-Decomposition method. R-values produced with QR-Decomposition can be applied to decompose a given system and indicate the degree of the significance of the decomposed parts. Selection of background blocks is conceptually obtained by choosing those parts which have weak contribution, according to the assigned R-values. The background model is constructed with these selected blocks. Simulation results showed that the proposed method produced better estimation of background with respect to some others.

Keywords: Background Subtraction, QR Decomposition, Gaussain Mixture Model, Singular Value Decomposition.

¹ GMM (Gaussian Mixture Model)