Iterative Optimization for Frame-by-frame Object Pose Tracking

Shuang Ye, Chuancai Liu, Zhiwu Li, Abdulrahman Al-Ahmari

PII: S1047-3203(17)30017-2
DOI: http://dx.doi.org/10.1016/j.jvcir.2017.01.017
Reference: YJVCI 1937

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

Received Date: 21 September 2016
Accepted Date: 13 January 2017

Please cite this article as: S. Ye, C. Liu, Z. Li, A. Al-Ahmari, Iterative Optimization for Frame-by-frame Object Pose Tracking, *J. Vis. Commun. Image R.* (2017), doi: http://dx.doi.org/10.1016/j.jvcir.2017.01.017

Iterative Optimization for Frame-by-frame Object Pose Tracking

Shuang Ye[a,b], Chuancai Liu[a], Zhiwu Li[c,d], Abdulrahman Al-Ahmari[e,f]

[a] *School of Computer Science and Engineering, Nanjing University of Science and Technology, Nanjing 210094, China*
[b] *School of Computer Science and Technology, Huaqiao University, Xiamen 361021, China*
[c] *Institute of Systems Engineering, Macau University of Science and Technology, Taipa, Macau*
[d] *School of Electro-Mechanical Engineering, Xidian University, Xi'an 710071, China*
[e] *Advanced Manufacturing Institute, King Saud University, Riyadh 11421, Saudi Arabia*
[f] *Industrial Engineering Department, College of Engineering, King Saud University, Saudi Arabia*

Abstract

Joint object tracking and pose estimation is an important issue in Augmented Reality (AR), interactive systems, and robotic systems. Many studies are based on object detection methods that only focus on the reliability of the features. Other methods combine object detection with frame-by-frame tracking using the temporal redundancy in the video. However, in some mixed methods, the interval between consecutive detection frames is usually too short to take the full advantage of the frame-by-frame tracking, or there is no appropriate switching mechanism between detection and tracking. In this paper, an iterative optimization tracking method is proposed to alleviate the deviations of the tracking points and prolong the interval, and thus speed up the pose estimation process. Moreover, an adaptive detection interval algorithm is developed, which can make the switch between detection and frame-by-frame tracking automatically according to the quality of frames so as to improve the accuracy in a tough tracking environment. Experimental results on the benchmark dataset manifest that the proposed algorithms, as an independent part, can be combined with some inter-frame tracking methods for optimization.

Keywords: object detection, frame-by-frame tracking, pose estimation, iterative optimization, probabilistic voting