A Novel Approach for Multi-Target Tracking Across Cameras

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Abstract

Multi-target tracking has found applications in diverse disciplines, includes Air traffic control, Intelligence surveillance and Reconnaissance (ISR), Space applications, Oceanography, Autonomous vehicles and robotics, remote sensing, computer vision and biomedical research. Most of the methods concentrating more on spatio-temporal cues. And some methods using online learned approaches to find the multiple targets trajectories with non-overlapping cameras.

Keywords: Multi-Camera Tracking, Cameras

I. INTRODUCTION

Multi-camera tracking has wide range of applications in both industrial and computational fields. There are several techniques arrived to track the people using different methods. Here I analyse some of the methods those track the multiple targets using multiple cameras.

First technique is Multicamera People Tracking with a Probabilistic Occupancy Map. It takes two to four synchronized video streams at eye level and from different angles, combines a generative model with dynamic programming to accurately follow up to six individuals across thousands of frames. Also derive metrically accurate trajectories for each of them. Here generative model can effectively handle occlusions in each time. Multiperson tracking can be reliably achieved by processing individual trajectories separately over long sequences.

Second technique is Multicamera Tracking of Articulated Human Motion Using Shape and Motion Cues. This method present a completely automatic algorithm for initializing and tracking the articulated motion of humans using image sequences obtained from multiple cameras. The segmented chains are registered in a subset of the frames using a single-frame registration technique. The tracking algorithm consists of a predictor that uses motion cues and a corrector that uses shape cues.

Third technique is A Bayesian Hierarchical Framework for Multitarget Labeling and Correspondence. The main purpose is to locate, label, and correspond multiple targets. Instead of directly corresponding objects among different camera views, the proposed framework adopts a fusion-inference strategy. In the fusion stage, formulate a posterior distribution to indicate the likelihood of having some moving targets at certain ground locations. In the inference stage, the scene model is inputted into a proposed Bayesian hierarchical detection framework, where the target labeling, target correspondence, and ghost removal are regarded as a unified optimization problem subject to 3-D scene priors, target priors, and foreground detection results.

Scalable Semi-Automatic Annotation for Multi-Camera Person Tracking is the fourth technique. Here use a generic methodology for the semi-automatic generation of reliable position annotations for evaluating multi-camera people-trackers on large video data sets. A small subset of the data, composed of tracks with insufficient reliability, is verified by a human using a simple binary decision task, a process faster than marking the correct person position. This framework is generic and can handle additional trackers.

And the final and efficient technique that I analysed is Integrating social grouping for multi-target tracking across cameras in CRF model. Tracking of multiple-targets using multiple non-overlapping cameras in order to find their trajectories. In this technique an online learning approach is being used for integrating high-level contextual information into tracking system.

A. Multicamera People Tracking with a Probabilistic Occupancy Map

In this paper, address the problem of keeping track of people who occlude each other using a small number of synchronized videos which were taken at head level and from very different angles. This is important because this kind of setup is very common for applications such as video surveillance in public places. Here combine a mathematically well-founded generative model that works in each frame individually with a simple approach to global optimization. This yields excellent performance by using basic color and motion models that could be further improved. First, demonstrate that a generative model can effectively handle occlusions at each time frame independently, even when the input data is of very poor quality, and is therefore easy to obtain. Second, showing that multi-person tracking can be reliably achieved by processing individual trajectories separately over long sequences.
B. Multi-camera Tracking of Articulated Human Motion Using Shape and Motion cues

Here presented a complete pose initialization and tracking algorithm using a flexible and full human body model that allows translation at complex joints such as the shoulder joint. The human body model is automatically estimated from the sequence using the an algorithm. Pose initialization is performed based on single frame segmentation and Registration of voxel data. An algorithm to perform temporal registration of partially segmented voxels for tracking was also suggested. Here used both motion cues and shape cues such as skeleton curves obtained from bottom-up voxel segmentation as well as silhouettes and “motion residues” to perform the tracking. And presented results on sequences with different kinds of motion and observe that the several independent cues used in the tracker enable it to perform in a robust manner.

C. A Bayesian Hierarchical Framework for Multitarget Labeling and Correspondence with Ghost Suppression over Multicamera Surveillance System

This method proposed an efficient way to simultaneously detect, locate, and label targets across multiple cameras. In this approach, ghost effect is analyzed and suppressed. Moreover, individual 3-D target model is iteratively refined. Algorithm consists of two major steps: information fusion and Bayesian inference. The proposed model-based information fusion step collects consistent information from multiple cameras. Fused information is coupled with priors to establish scene knowledge. Scene knowledge is then treated as extra information to be used in labeling, correspondence, and ghost suppression.

In the Bayesian inference step, the whole process is modelled and resolved under the proposed BHF framework. Based on the BHF framework, inter-target occlusion, ghost suppression, and determination of target number are effectively handled in a systematic manner.

D. Scalable Semi-Automatic Annotation for Multi-Camera Person Tracking

This paper is a novel procedure to fuse the outcomes of multiple trackers that involves estimating the error statistics of the individual trackers (and their joint failure modes) by comparing their output to a reliable people detector. The consensus tracker based on these statistics results in more accurate tracking than averaging the trackers outputs, and the individual output of the trackers. And a method to estimate the time needed for the manual part of the proposed procedure. Here also estimate the precision of the resulting semi-automatically annotated data set, under given values of desired accuracy. And demonstrated the performance of our method with experiments on a multi-camera video dataset of about 6 hours duration, showing scalability in semi-automatic annotation for long multi camera sequences for the first time.

E. Integrating Social Grouping for Multi-target Tracking Across Cameras in a CRF Model

In this method, presented a novel CRF model based framework for multi-target tracking across a network of non-overlapping cameras. The proposed model is able to systematically integrate social grouping behavior as the high-level contextual information for reducing ambiguities in track association. An online learned CRF model is used to associate tracks from different cameras that contains the same person. A global appearance model is used to estimate the energy costs for each node.

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