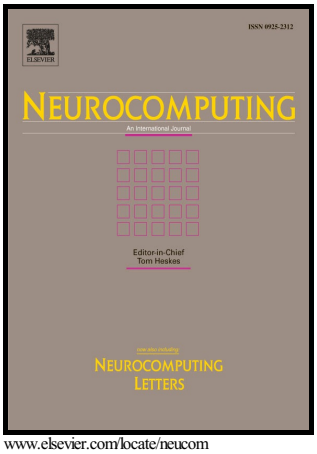

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Multi-Target Tracking Via Hierarchical Association Learning

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Abstract: To deal with the issue of multi-target tracking, this paper proposes a hierarchical correlation multi-target tracking trajectory generation method. On the basis of target detection results, the AdaBoost algorithm combined with online discriminant analysis apparent model is first utilized to achieve initial moving object tracking trajectories; then, the Hungarian algorithm is utilized to optimize fragmented and discontinuous tracking trajectories to achieve stable and accurate trajectories fragments; finally, energy minimization based intelligent extrapolation algorithm is utilized to achieve final smoother and continuous tracking trajectories. Experimental results on PETS 2009/2010 benchmark and TUD-Stadtmitte video database demonstrate the effectiveness and efficiency of the proposed method .
Key Words: Hierarchical Correlation, Adaboost Algorithm, Online Discriminant Analysis Apparent Model, Hungarian Algorithm, Continuous Energy Minimization

1. INTRODUCTION

Multi-target tracking has emerged as an active research topic in the past few decades due to its widespread applications in many areas, including intelligent surveillance, smart rooms, visual human computer interfaces, autonomous robotics, augmented reality and video compression [1-15]. However, robust tracking of multi-target remains a huge challenge, especially in the case of partial occlusion, illumination variation, pose change, and background clutter. To improve the performance of multi-target tracking, continuous minimum energy based method is proposed in [16], where the information of a moving object is utilized to construct an energy function and optimal tracking trajectory is obtained by solving the energy function based on the association strategy.

Inspired by the idea in [16], this paper proposes a tracking method combining the hierarchical correlation and the apparent model. Specifically, tracking fragments are first obtained according to the information of color, texture and gradient; then, the double threshold method is utilized to obtain correlated tracking fragments; finally, tracking fragments are further correlated to achieve the final continuous and smooth tracking trajectories. Different from the continuous minimum energy based method, the proposed method takes into account not only the trajectory information of the past and current frames, but also the estimated trajectory information of future frames.

The basic idea of the proposed multi-target tracking method based on the hierarchical correlation is shown in Figure 1, where the initial tracking fragments are achieved by the online AdaBoost algorithm in [17], and deep correlation of tracking trajectories are implemented by the intelligent extrapolation strategies including lengthening and shorting strategies, adding and deleting strategies, and merging and splitting strategies.

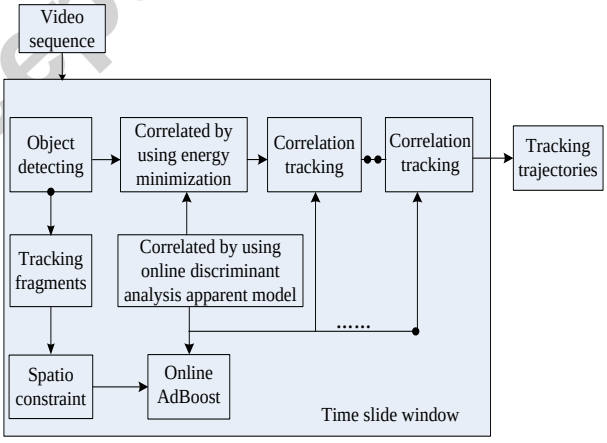

Figure 1: The basic idea of the proposed hierarchical correlation multi-target tracking method.

The rest of the paper is organized as follows. The detail of the proposed approach is presented in section 2. The experiments are shown in section 3. The conclusions and future works are given in section 4.