

A PARTICLE FILTER APPROACH FOR MULTI-CAMERA TRACKING SYSTEMS IN A LARGE VIEW SPACE

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ABSTRACT. *A video tracking system has many potential applications, particularly in security, monitoring and robotics. The most important problem in tracking systems is object motion tracking. In this paper, we present a new method that combines footstep prediction and particle filter to manage some problems inherent in manipulating a large view image space. We compare various methods and evaluate their capabilities.*

Keywords: Particle filter, Multi-camera, Tracking system, Large view and human tracking

1. **Introduction.** Tracking multiple people in a large view space is an important concern in many applications such as surveillance systems, monitoring systems, and human behavior analysis. Many researchers are currently working in this area. For example, Zhao *et al.* have proposed a novel stereo segmentation and tracking technique to handle multiple human movements in groups in a cluttered environment [1]. Bowden and KaewTraKulPong presented a salient reappearance period method for the occlusion problem [2]. Abe *et al.* used the frequency-pattern-enhanced subtraction technique to detect and track small object motion in wide-area outdoor tracking for surveillance systems [3]. Tracking people over a broad area is much more challenging, such as with a complex spatial layout [4], large state space [5] and with the use of multiple cameras [5] or sensors to cover the view of a space [6,7]. In this paper, we present a new method that combines particle filters with a footstep method to predict the direction of human movement. The method can address the following problems in a large view case:

- I. Multiple directions:** In a large view case, the camera will record movements of various objects in different directions. For example, in a shopping complex, airport area, station concourse, street area, or school campus, different people may move in different directions. Hence, it is important in tracking multiple humans for a system to track multiple directions of motion.
- II. Perspective:** Whether an object is moving toward or away from the camera will affect the image size of the object as captured by the camera. This factor will directly affect the tracking process.
- III. Hidden objects or occlusion:** Conventional methods have difficulty in tracking hidden objects in the presence of occlusion. Even if occlusion can be avoided, it is still difficult to track objects continuously.
- IV. Processing time:** In a multi-camera tracking system, real-time processing is one of the most important issues to be considered. The system will record a huge volume of video data using various cameras that have different angles of view for each video.