

# **Research on object tracking techniques and their application in surveillance camera problems**

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**Abstract:** This study investigates advanced object tracking techniques and their application within surveillance camera systems. Addressing the critical challenges of occlusion, illumination variation, and real-time processing constraints, the research systematically evaluates both traditional correlation filter-based methods and modern deep learning approaches, including Siamese networks and Transformer architectures. A novel hybrid tracking framework is proposed, integrating a motion prediction module with an adaptive appearance model to enhance robustness in complex surveillance environments. Experimental validation on benchmark datasets, such as OTB-100 and LaSOT, demonstrates that the proposed method achieves superior accuracy and processing speed compared to existing state-of-the-art algorithms. Furthermore, the framework is specifically adapted for multi-camera handover scenarios, enabling seamless object re-identification across non-overlapping fields of view. The findings provide a practical solution for intelligent video surveillance, offering significant improvements in tracking stability and computational efficiency for real-world deployment.

**Keywords:** Object tracking, surveillance camera, computer vision, video analytics