摘 要

运动目标跟踪技术是近年来计算机视觉技术的热点研究方向之一，在智能监控、医疗影像、自动驾驶、无人机视觉导航等领域都有着广泛的应用。然而由于跟踪场景的复杂多变性，当面临快速运动、运动模糊、形状变化等目标外观改变，以及噪声干扰、光照变化、低分辨率等环境变化时，使用单种特征进行跟踪容易造成跟踪漂移[1]，而目标被遮挡是引起跟踪失败的主要原因。

本文针对复杂场景下目标跟踪的各种难点问题进行了分析，在此基础上介绍了传统的相关滤波算法，基于相关滤波算法的优缺点，提出了一种基于多特征融合以及重检测的目标跟踪算法框架。本文主要研究内容包括如下:

(1)研究了目标跟踪相关理论，对跟踪中常用的几种特征进行了研究，并对它们的性能和特点进行了分析。提出了多特征联合使用来增强跟踪场景适应性的特征的使用策略，使得跟踪算法更有利于在各种场景下进行跟踪。

(2)研究了相关滤波方法的相关理论，介绍了算法的基本理论和基本步骤。针对相关滤波跟踪器无法评价当前跟踪效果的不足，增加了跟踪效果评价模块，使得跟踪器可以判断目标是否已经丢失。

(3)针对跟踪中目标发生遮挡后无法继续跟踪的问题，引入了重检测模块，根据跟踪效果评价模块的输出，当判断目标丢失时，在图像中重新检测目标，待找到目标后重新启动跟踪。

(4)最后，本文在大规模公开数据集对目前主流的几种跟踪器和本文提出的跟踪器进行评测和比较。实验表明，相较于传统算法，本文算法在复杂场景下的跟踪效果取得了满意的效果。

关键词：目标跟踪，复杂场景，目标遮挡，相关滤波，预测跟踪

ABSTRACT

Moving target tracking is a popular research directions of computer vision technology in recent years. It has been widely used in intelligent surveillance, medical imaging, automatic driving, visual navigation and other fields. However, due to the complexity and variability of tracking scene, while facing fast motion, motion blurring, shape change and other changes in the appearance of the target, as well as noise interference, illumination change, low resolution and other environmental changes, tracking drift is easily caused by using a single feature, and the main reason for tracking failure is that the target is occluded.

In this thesis, the difficulties of target tracking in complex scenes are analyzed. On this basis, the traditional correlation filtering algorithm is introduced. Based on the advantages and disadvantages of the correlation filtering algorithm, a framework of target tracking algorithm based on multi-feature fusion and re-detection is proposed. The main contents of this thesis are as follows:

(1) The related theory of target tracking is studied, several common features in target tracking are studied, and their performances and characteristics are analyzed. A strategy of using multi-feature to enhance the adaptability of tracking scene is proposed, which makes the tracking algorithm more conducive to tracking in various scenarios.

(2) The related theory of correlation filtering method is studied, and the basic theory and steps of the algorithm are introduced. In order to overcome the shortcomings of correlation filter tracker which can no evaluate current tracking effect, a tracking effect evaluation module is added to enable the tracker to judge whether the target has been lost.

(3) Aiming at the problem that the target cannot continue tracking after occlusion occurs in tracking, the re-detection module is introduced. According to the output of the tracking effect evaluation module, when the target is lost, the target is re-detected in the image, and the tracking is restarted after the target is found.

(4) Finally, this thesis evaluates and compares several mainstream trackers and the trackers proposed in this thesis on large-scale open datasets. Experiments show that compared with the traditional algorithm, the tracking effect of this algorithm in complex scenes has achieved satisfactory results.

Keywords: target tracking, complex scene, object occlusion, kernelized correlation filter