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Detection and Tracking Cows by Computer Vision and Image Classification Methods

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ABSTRACT

In this paper, the cow recognition and traction in video sequences is studied. In the recognition phase, this paper does some discussion and analysis which aim at different classification algorithms and feature extraction algorithms, and cow's detection is transformed into a binary classification problem. The detection method extracts cow's features using a method of multiple feature fusion. These features include edge characters which reflects the cow body contour, grey value, and spatial position relationship. In addition, the algorithm detects the cow body through the classifier which is trained by Gentle Adaboost algorithm. Experiments show that the method has good detection performance when the target has deformation or the contrast between target and background is low. Compared with the general target detection algorithm, this method reduces the miss rate and the detection precision is improved. Detection rate can reach 97.3%. In traction phase, the popular compressive tracking (CT) algorithm is proposed. The learning rate is changed through adaptively calculating the pap distance of image block. Moreover, the update for target model is stopped to avoid introducing error and noise when the classification response values are negative. The experiment results show that the improved tracking algorithm can effectively solve the target model update by mistaken when there are large covers or the attitude is changed frequently. For the detection and tracking of cow body, a detection and tracking framework for the image of cow is built and the detector is combined with the tracking framework. The algorithm test for some video sequences under the complex environment indicates the detection algorithm based on improved compressed perception shows good tracking effect in the changing and complicated background.

KEYWORDS

Compressive Tracking, Cow Detection, Cow Tracking, Feature Fusion, Gentle Adaboost

1. INTRODUCTION

1.1 Research Background and Significance

Video intelligent behavior analysis technology is a multidisciplinary frontier subject in computer vision field. It is of great scientific significance and can be widely used in the future. Moving target detection and tracking is the core technologies of video intelligent behavior analysis technology. Target detection and tracking technology has made great progress at present. Experts at home and abroad have also come up with a number of effective detection and tracking algorithm. However, in order to improve the accuracy, instantaneity and robustness, some key factors, including the illumination, scale

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change, target deformation and target occlusion during the detection and tracking process. Therefore, if we can find a way to solve problems that will have a influence on the target detection and tracking performance under a complex circumstance, we will build a real-time, efficient and robust detection and tracking system, which will be of great academic significance and research value to the study of video intelligent behavior analysis (Li & Zhuqing, 2010; Yuan, 2012).

As a comprehensive technology, target detection and tracking technology involves many subjects including image processing, pattern recognition, artificial intelligence and machine learning and so on. With its great research value, this technology has been widely used to power, military, aerospace, transportation and other industries of the national economy. The target detection tracking and behavior analysis technology can be used in the power system to make prewarning, deal with things during the process and take the evidence afterwards. Meanwhile, the target detection functions can be improved, like operation detection, object movement detection, perimeter intrusion detection, pyrotechnic detection, automatically track and alarm to the target. In this way, intelligent and people-oriented monitoring can be achieved (Ke & Li, 2014). This technology has been developed and improved continuously with the help of application in the fields of power industry, unattended substations.

In this thesis, cow detection and tracking are taken as an example to discuss about the general algorithm and improved methods of the target detection and tracking. With the constant development of science and technology, computer information technology is not only applied in electricity, transportation, aerospace and other industrial sectors, but animal husbandry will also make use of the technology to become automatic and intelligent. Great efforts have been made to promote the informationization construction of agriculture and animal husbandry, which provides a good condition for the application of video intelligent analysis on agriculture and animal husbandry. Video intelligent analysis is a branch of computer science. It develops rapidly in recent years for the following reasons. First, it has a complete theoretical knowledge system that can solve different problems. Second, as the decrease in the research and development cost, high-end equipment in some key departments which were applied to military, aerospace now can be used in civilian market. The video intelligent analysis technology is built based on the analysis above. It will be an inevitable trend in the aquaculture development because it's scientific, economic and convenient (Xie, 2015).

In China, a centralized dairy farming system with high density has been basically formed at present. But, there are still many problems such as milk in low quality, low production efficiency, high cost and so on. Here are the main reasons for the problems: extensive management, low process automation, inaccuracy during the production process and etc. Thus, the application of intelligent analysis and automatic identification technology will detect and make diagnosis of abnormal behavior and events in time during the raising process, so as to effectively help staff to deal with problems, which is of economic significance for improving the efficiency of dairy farming production and increasing the nutrition level in the milk. It is also the main research trend about informatization and precision of modern agriculture.

1.2 Studies at Home and Abroad

1.2.1 Studies on Target Detection

Target detection is one of the important research topics in image processing and machine vision. At present, there are many excellent target detection algorithms at home and abroad. The existing target detection methods are as follows: target detection based on background difference, target detection based on inter-frame difference, target detection based on template matching, target detection based on optical flow and target detection based on machine learning.

The target detection based on background difference and target detection based on inter-frame difference can be used to detect moving target. The target detection method based on template matching can detect still objects. However, if the calculating amount is quite large, the quality of matching depends on the accuracy and detail of the target template (Gang et al., 2006; Pei, 2009). The target detection method based on machine learning is the main trend of the current research field