OpenCV Detection of Athletes in Long Jumping Videos

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Abstract

The precise analysis of long jumper's technical videos can provide the important information for the coaches to formulate the training program. To realize the analysis of technical videos, we must firstly detect and track the long jumpers in the video. OpenCV technique (open source computer vision library supported by the Intel company) is preferable in the field of image processing. This paper aims to study how to detect the athletes in long jumper's technical video based on OpenCV technique and provide some technical reference to the related research.

Key words: long jump, detection, algorithm

1. Introduction

The modern high-tech achievements, the latest knowledge and the latest technologies play an important role in the improvement of competitive sport. The long jump is a run and jump close-knit sport, which is composed of run-up, takes-off, flight and landing. Its competition result is related to many factors, which leads to be difficult to the training for the coaches [1-3]. So, the application of the modern high-tech achievement in long jump training is necessary. This will help the athletes to finish every action in the long jump, as well as the organic integration of the various parts of action.

Scientific and reasonable training is one of the key factors for the athletes to obtain excellent results. To establish a targeted, coherent and scientific training system; the reasonable evaluation of the technical features of the long jumpers is essential in the training. Accurate analysis of the long jumpers' technological videos is the effective way to achieve the goal. To realize the analysis of technical videos, we firstly need to detect and track the jumper in the videos. The OpenCV technique (open source computer vision library supported by the Intel Company) is preferable in the field of image processing [4-10]. This paper aims to study how to detect the athletes in long jumper's technical video based on OpenCV technique and provide some technical reference to the related research.

2. Technical Schemes

The detection of athletes in the videos belongs to an important part of computer vision research, and it combines image processing, pattern recognition, artificial intelligence, as well as automatic control and many other advanced technologies in many areas. Nowadays there are a lot of methods which can realize the detection of moving targets, but in view of Surendra Background Refresh algorithm owns advantages like simple algorithm, program easy realization, decrement of influence of moving targets on background, and it could offer better detection result of moving targets, this article will

use this algorithm to realize the detection of athletes in technological videos.

Something needed to be added since the brightness threshold in Surendra algorithm is constant. It does not fit well in complex environments like light changing. This article will improve the Surendra algorithm appropriately. The threshold is automatically obtained by OTSI. The background update mask to control the background update is obtained using the inter-frame difference method. Finally, combine morphological dilation and erosion algorithm correction foreground image. Therefore, the improved Surendra algorithm in our work is as below [11-13]:

(1) Obtain the first image I_1 which will be used as the background B;

(2) Select the initial threshold T=60 and use OTSU to get dynamic thresholds automatically based on previous images;

(3) obtain the two-value image Dk by pixel difference between the current I_k and previous I_{k-1}

$$D_k = \begin{cases} 255 & |I_k - I_{k-1}| > T \\ 0 & |I_k - I_{k-1}| < T \end{cases} \quad (1)$$

(4) update background image B_k according to image D_k,

$$B_k(x,y) = \begin{cases} B_{k-1}(x,y) & D_k = 255 \\ aI_k + (1-a)B_{k-1}(x,y) & D_k = 0 \end{cases} \quad (2)$$

In the formula, $B_k(x,y)$, $D_k(x,y)$ respectively for the background image and the foreground image in the luminance value at (x,y); I_k is the k-th frame of the input image, a is an iterative coefficient;

(5) iterative coefficient m = m + 1;

(6) difference the current image and background to get the moving target's foreground $F_k(x,y)$,

$$F_k(x,y) = |I_k(x,y) - B_k(x,y)| \quad (3)$$

Based on this algorithm above, the improved Surendra algorithm's flow chart is:

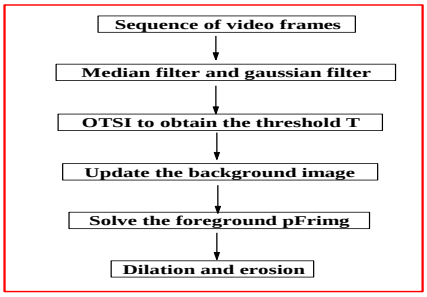

Fig. 1: The flow chart of improved Surendra algorithm.

3. Result and Discussion

The results of target detecting by the improved Surendra algorithm are shown in figure 2. Where, the threshold of the first frame equals to 60. The thresholds of the 171th and 202th frame are 90 and 110 respectively.

(a) the detecting result of the first frame

(b) the detecting result of the 171th frame

(c) the detecting result of the 202th frame

Fig. 2: The target detection by Surendra algorithm.

As can be seen, the self adapting background image can be obtained and the contour of the athletes presented is complete by the improved Surendra algorithm. Moreover, this method can not nearly be affected by the light and other environment, and the given information about the targets is also complete, such as the position, size and shape of the target. In summary, we achieve the detection of athletes in long jumper videos by the improved Surendra algorithm, and the description of the moving targets is complete and accurate.

4. Conclusions

The reasonable evaluation of the technical features of the long jumpers can be achieved by the accurate analysis of the long jumpers videos. This can provide the important information for the coaches to formulate the training program. To achieve the analysis of technological videos, wemust firstly detect and track the jumpers in the videos.

Based on OpenCV technique platform, we achieve the detection of athletes in long jumper videos by the Surendra algorithm combined with OTSU algorithm. The results show that the self adapting background image can be obtained and the contour of the athletes presented is complete by this method. Moreover, this method can present compressive information about the targets such as the position, size and shape of the target. Our technical schemes can provide some technical reference to the related research.

5. Acknowledge

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