

# A Novel Method of Target Tracking Algorithms Applied in Mis

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**Abstract:** In order to solve the shortcomings of existing target tracking algorithms applied in MIS, this invention does some optimization based on TLST model and proposes a novel target tracking algorithm combined with KCF and region growing algorithm. Compared with the traditional TLST, our optimized multi-model TLST reduces the complexity of computation and has a better performance on dealing with singular point. Then, through combining KCF and region growing algorithm, the rigid surgical tool can be detected more accurately. Besides, this invention proposes a novel feature extraction which can be optionally used to do further examination.

**Publication date:** December, 2019

**Publication online:** 31 December, 2019

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## 1 Introduction

With the development of technology, the concept of “Virtual streamer” is gradually catching more and more attentions. Since the world’s first ever virtual streamer, Ananova, was created in the UK in 2001, these virtual streamers have been applied to various social network sites, for instance youtube. Comparing with real person live streams, it only needs a single virtual character to broadcast. As it can board cast 24 hours a day without rest, its convenience has been widely recognised by the public. In 2016, Kizunaai, a virtual streamer created by the Japanese, ushered in a new era of this technology. Different from the earlier versions, Kizunaai has a pre designed 3D model appearance, while a real person wears motion capture equipment to control her facial

expressions and movements. Dubs and lip-syncs are controlled by voice actor to carry out life streams. Moreover, her animation appearance breaks the limit that a virtual streamer must looks exactly like a human.

Our research further developers some improvements based on the previous concepts. Currently, most animations are created by building models and inputting motion captured dates. However during the processes of motion capture recordings, there will always be some problems, such as loss of frame number and character teleports. Our method, however, can correct these errors effectively and produces smoother and more natural movements of the character. Though continuous improvement, virtual streamers can not only provide basic services for example weather broadcasting, but their appearances can also be manipulated according to users preference. In the future, they will be even more useful . They will be linked to internet in order to capture more information. As for the application, currently virtual streamers are used in showcases, TV programs as well as business. They would be adopted to websites in the futures, so that all view points and features of the websites can be expressed by virtual streamers.

## 2 Method

The first step is to import and read BVH data. With the help of github.com 's author, '20Tab S.r.l.' To read data from the python program. Through this program, we obtain the skeleton information, frame number information, node direction number and node information of each frame of bvh file. After that, according to the skeleton structure, we output the frame-by-frame data in each direction owned by the node,

including up to six direction data, such as coordinate position and node rotation angle, and combine the data in each direction into a series of data to facilitate the observation of the change and trend of the data.

After that, the node data is transformed into frame-by-frame animation of 3D bone frame in coordinate system by python code, so that we can observe the data prototype and understand the processing effect, and the approximate moving range of the skeleton is determined by the program.

After importing the data and determining the approximate range, the data is processed. First, create a sliding window to instantly determine the value in an area. After repeated testing, an offset threshold is obtained. For example, by observing the video, it is concluded that the velocity range of the human arm is about within 1m/s. According to the time interval of the sampling point multiplied by the maximum possible moving speed, the theoretical maximum possible displacement value is obtained, which is defined as the threshold value. Next, if the gap between the average distance of a point in the slider is greater than the threshold, the point is determined to be the sampling error point, the error value is deleted, and the interpolation method is used to recalculate it.

Whether it is a Lagrange interpolation or a Newton interpolation, the essence is a polynomial that depicts the original function of a node as accurately as possible. But the contradiction of polynomial interpolation is that if there are too few nodes, the interpolated function may deviate greatly from the original function. However, if there are too many nodes, the order of polynomial will need to be increased accordingly, but too high order will easily cause the plotted interpolation curve to be unstable at the edge, which is the Longge phenomenon.

About avoiding errors. The disadvantage of Newton interpolation method is that the Runge phenomenon will appear at the edge, but we can keep the point that needs to be recalculated in the relative midpoint position by sliding window, and there is no need to calculate at the edge, so we can just avoid the error caused by the Runge phenomenon.

### 3 Results

In order to solve the shortcomings of existing target tracking algorithms applied in MIS, this invention does some optimization based on TLST model and proposes a novel target tracking algorithm combined with KCF and region growing algorithm. Compared with the traditional TLST, our optimized multi-model TLST reduces the complexity of computation and has a better performance on dealing with singular point. Then, through combining KCF and region growing algorithm, the rigid surgical tool can be detected more accurately. Besides, this invention proposes a novel feature extraction which can be optionally used to do further examination.

The technical solution of this invention can be implemented as follows:

Step (1), traditional TLST model can be optimized into TLST-I by only traversing ROI instead of the whole image and classifying superpixels into three types according to gradient, which is convenient for dealing with singular point and obviously reduces the complexity of calculation.

Step (2), TLST-I can integrate image similarity weight model to detect target, while using DSST achieves scale invariant. This multi-model TSTL algorithm has a good performance on surgical target detection.

Step (3), to detect surgical tool, region-growing is applied within ROI detected by KCF to obtain the contour of target.

Step (4), to make the tracking process more robust, it is possible to verify the result, after obtaining the contours of the target, according to a novel feature extraction method, making contours more accurate.

### 4 Conclusion

Node unidirectional data sequence. After that, the node data is transformed into frame-by-frame animation of 3D bone frame in coordinate system by python code, so that we can observe the data prototype and understand the processing effect.