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RESEARCHES CONCERNING THE UTILIZATION OF THE KINEMATIC ANALYSIS MOVEMENT SOFTWARE IN 2D SYSTEM – DARTFISH© IN THE MALE TRIPLE JUMP EVENT TECHNIQUE MONITORING

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Abstract

Purpose. The determination of the operational route that is necessary to use the kinematic analysis Dartfish© software in the monitoring activity of the male triple jump event technique.

Methods. To achieve this research there were used some research methods such: kinematic analysis method, case study method, experimental method.

Results. There were established the steps of the operational route necessary to use the kinematic analysis Dartfish software in the monitoring activity of the male triple jump event technique.

Conclusions. The utilization of the Dartfish© software can represent a useful instrument in the monitoring activity of the male triple jump technique by implementing it in the sportive training process.

Key words: kinematic analysis, monitoring, triple jump, Dartfish© software.

Purpose

The permanent improvement of the instruments and methods used in order to monitor the technique aspects of the human movement determined the obtaining of some more accurate information regarding to the basic element of the movement, influencing in a favorable way the scientific research activity that is necessary in order to provide quality and efficiency to the means that are used in the sportive training process. "The science of the information promotes new instruments to analyze the sportive performance following some methodological and technological progresses in sportive and physical activities domain. So, using the modern technologies gives the possibility that the training process of the physical education and sport domain should be approached from a different perspective." [DUPUI, P., 2003, pp. 7 - 13]**.**The using of some instruments with more and more various utilization options, electronic control devices, different types of behaviors recording, answers processing and the necessary information presentation, made the movement analysis to become a component that complete the supporting elements that the scientific research activity has to base on trying to amplify in a positive sense the effects of the sportive training process.The aim of this research was to determine the operational route that is necessary to use the kinematic analysis Dartfish© software in the monitoring activity of the male triple jump event technique.

In order to accomplish this aim we planned the fulfillment of the following objectives:

1. The identification of the technical features specific to the 2D movement analysis;
2. The determination of the action ways that are compatible with the monitoring activity of the male triple jump event technique;
3. The establishment of the operational design necessary to implement the 2D Dartfish© movement kinematic analysis software in the framework of the monitoring means specific to the male triple jump event.

Method

The research was based on the case study along with the kinematic analysis method, documentary informatics method, experimental method, graphic and table method and it was focused on the components of the Olympic and National Team of the Romanian Track and Field Federation, specialized in the triple jump event.Three video cameras were used (two having its own memory storage space - the hard disk – and one the possibility to record on mini DV) in order to record images that will be processed later using Dartfish© software. For the third video camera which had a mini DV tape images storage system we used an image processing program called „Ulead Video Studio".The three cameras were positioned in order to include in the filming angles the technical behaviour of the athletes starting with the first hit phase.

Results

After the video images recording the video material was transferred in the PC and processed to obtain images recorded with 50 frames/second. The result of this processing was materialized in the establishment of the time between two consecutive frames – 0.020 seconds meaning 20 milliseconds, representing in the same time he temporal distance that was used to process the images using the Dartfish© movement kinematic analysis software – Analyzer module. Using the Dartfish© software for the kinematic analysis means the browsing of the following steps (http://www.dartfish.com/en/support-video-software/documentation/index.htm, 2008):

- the images are imported in the PC and they are saved as video clip;
- the Dartfish© software in opening and from the instruments bar the Analyzer option is chosen;
- selecting the clip that will be analyzed;
- rewinding the clip (frame by frame) in order to establish the moments that will be analyzed;
- establishing the time of the analyzed clip.

From this moment the movement analysis may began by following the next actions (according with the kinematic components that will be analyzed):

- the establishment of the frame that will be analyzed;

• the visualizing of the markers from the analysis as well as the delimitation of the involved segments and joints;

• after the determination of the markers, segments and joints that will be analyzed the kinematic component (s) that will be approached is (are) selected (velocity, trajectory, angle);

• after the kinematic components establishment a table is being opened where there will be inserted the data that is specific to each kinematic indicator;

• after that the data are exported in the Excel program to be statistically processed and graphical lineup that will emphasize the important aspects of the analyzed movements.

The stages of the operational route that is necessary to use the kinematic analysis Dartfish© software in the monitoring activity of the male triple jump event technique were based on the previous presented steps and concerned the following:

- the establishment of the technical aspects the will be monitored: the technical behaviuor of the athletes after the first hit phase;

- the location of the video cameras at optimum distances in order to record images that will be processed later by using Dartfish© software: each side of the motion plan recording the movements of the hit and swing leg;

- the establishment of the image acquisition rate – the same for all recorded images;

- the delimitation as video clip of the images that will be kinematic processed and analyzed: each trial of the athletes was processed in order to obtain clips that will contain images concerning the hop, step and long jump;

- opening of the Dartfish© software – analyzer module, selection of the wanted clip and the establishment of its time (fig. 1, 2, 3);

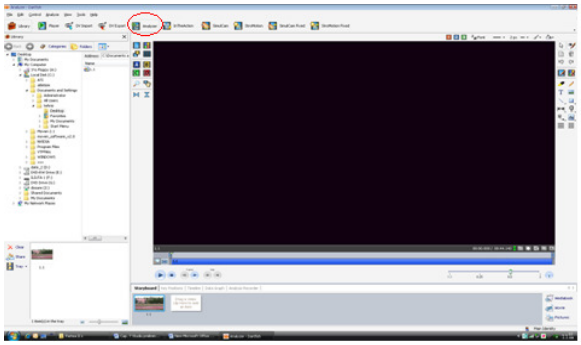

Fig. 1. Choosing the Analyzer option from the instruments bar of the Dartfish© software

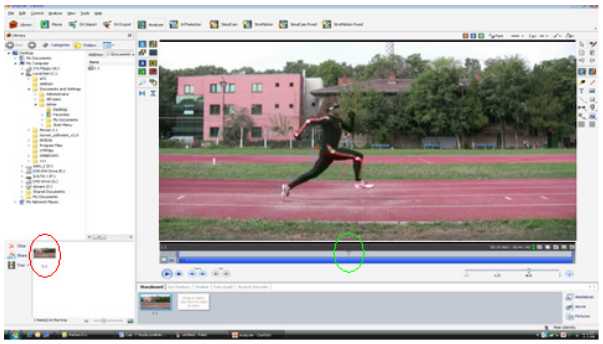

Fig.2. Selecting and rewinding the clip

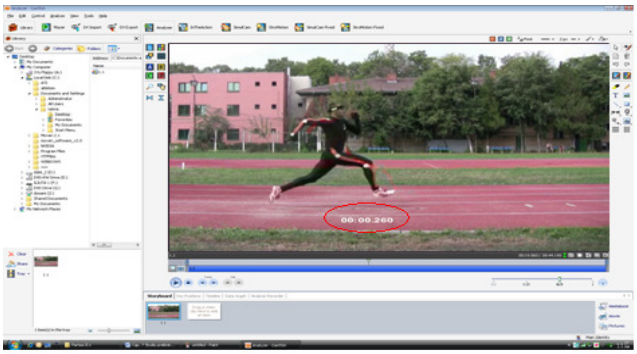

Fig.3. Establishing the clip time

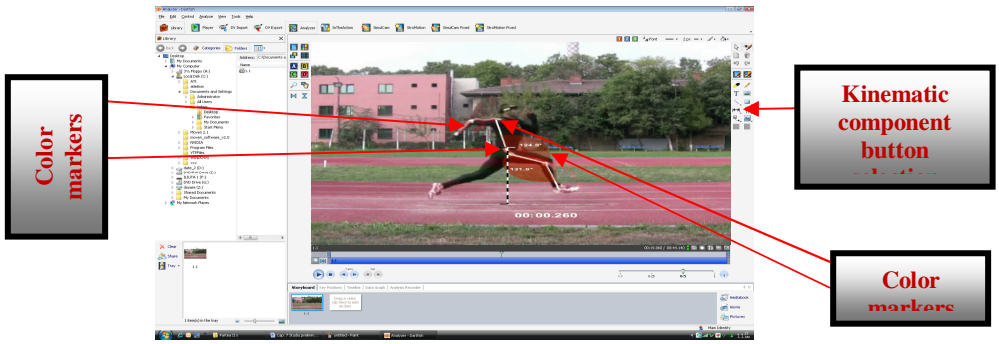

Fig.4. The visualization of the markers and the determination of the kinematic indicators

- the visualization of the color markers and the establishment of the kinematic components wanted to be analyzed: the height and trajectory of the point that represents the position of the bogy mass center established in the standing position; the trajectory of the ankle, knee, hip and shoulder joints; the angle from the knee and hip joints, as well as the contact, hit and take-off angle; the distance between the projection of the body mass center on the ground and the contact point of the hit leg in the hit phase moment (fig.4);

- the opening of a table from the instruments bar of the soft and the insertion of the values corresponding to the selected kinematic parameters (fig. 5);

- the exporting of the data in the Excel program and their statistic, mathematic and graphic processing (fig. 6).

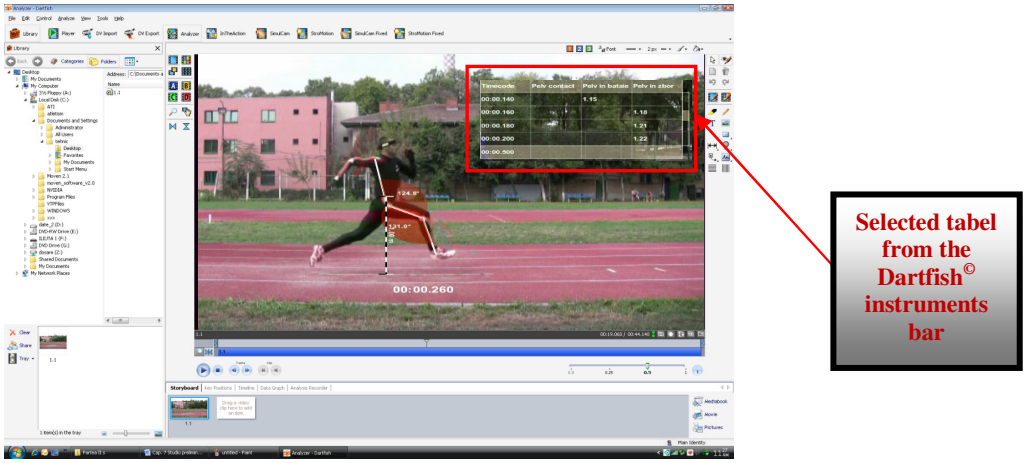

Fig.5. The insertion of the data in the Dartfish© work table

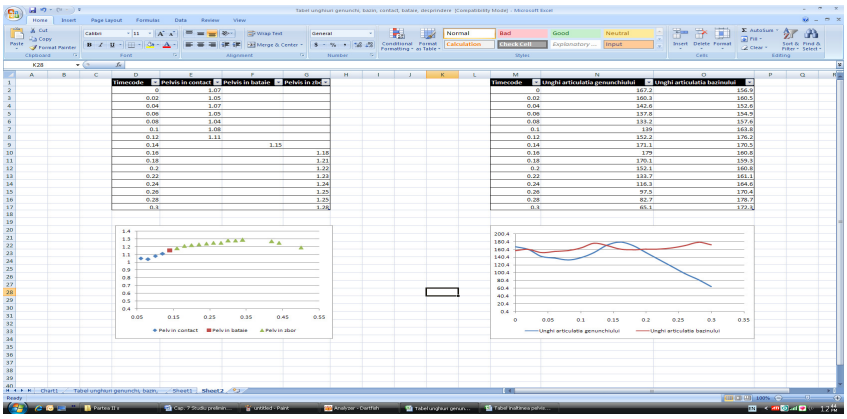

Fig.6. The Excel export and processing data

Discussion and conclusion

- by determining and graphic representing the B.M.C. trajectory or of different joints of the body we can obtain data that shall emphasize their direction and oscillations registered during the base mechanism elements (fig. 7);

Fig. 7. Representations of different points and joints trajectories

• the determination of the angles specific to this type of jump (the angles of contact, hit and take-off; the angle formed in the hip and knee's joints both at the hit and swing legs' level) allows emphasizing some information which by its value, represents elements of assessment of the technical behavior of the inferior limbs' level, helping to the monitoring of the technique in the whole event (fig. 8);

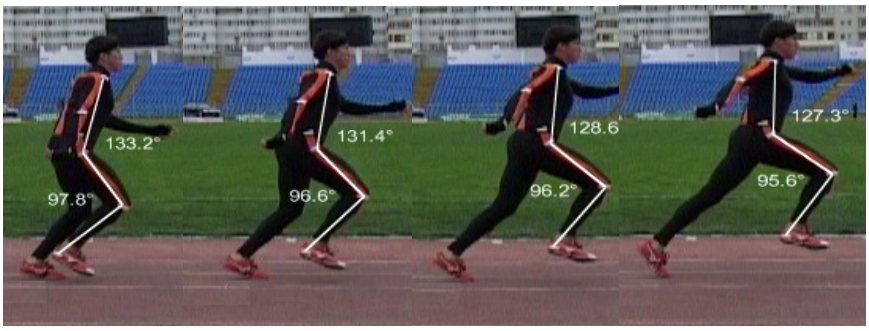

Fig.8. representing the angles during some moments of hit phase

• the determination of the B.M.C. during the different phases of the base mechanism of the event emphasizes the trajectory that the athlete describes it, giving to the coach clues about the way that the athlete records wrong oscillation in vertical axis during the running or uses his force to take-off from the hit (too much on the vertical or too much on the horizontal) (fig. 9);

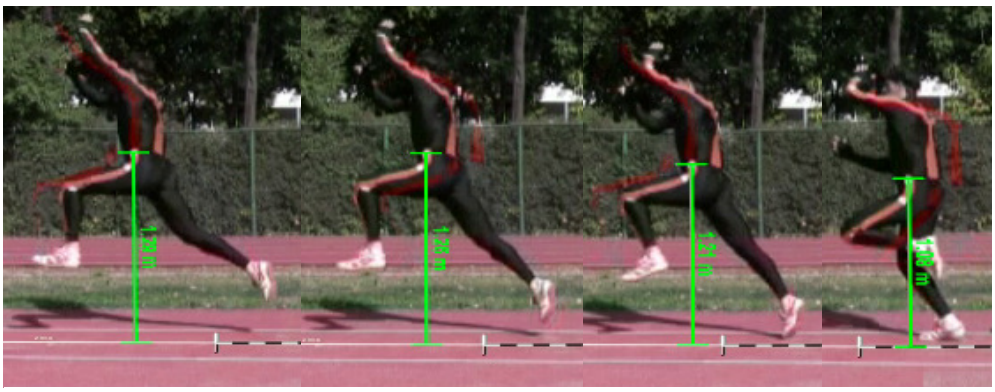

Fig.9. The B.M.C. representations during some moments of the hit phase

Using the kinematic analysis software of the movement in 2D system in order to monitor the male triple jump event technique can represent a support element in the sportive training process – technical training component – being used in video images processing to record figure data but also to elaborate instruments of visual representation of the technical behaviour;

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DUPUIS, P., 2003, *Informatic instruments in collective sports* (translation) – High performance sport no.466 – Internal use- Bucharest, pp.7-13;

http://www.dartfish.com/en/support-video-software/documentation/index.htm, 22.09.2008.