Exercise & Sports Biomechanics
Dr. Viswanath Sundar
Department of Physical Education & Sport Science
Visva-Bharati University, Shantiniketan (WB)
Week 03
Lecture 14
Dartfish (Contd.)

[Hello, everyone! Welcome back to this course. In this video, we will explore **different qualitative analysis methods using Dartfish software**].

In the previous video, we did the qualitative analysis using a single video on the screen. Now, moving forward, **we will compare two videos**.

Comparison means we can compare the video of the same athlete before and after intervention, or the video can be compared with elite athletes to understand the strengths and weaknesses of the athlete.

For comparing the videos, the **first step** is to click on the edit, and there is an option called A and B. The comparison module is here. Once you click that, one video will be displayed on the left side, and there will be a blank on the right side. Here, I have one sample video for educational purposes only. If you notice, each video has a different timeline at the bottom. In addition, we have a jog wheel separately for both videos. The first step is to sync the videos of 1 and 2. For that, we need to identify the right spot. So, the athlete is in the set position on the right side.

To make the video more precise, you can use the jog wheel to identify where the initiation of the movement is. In the same way, I am checking on the right side. From the set position, where is the initiation of the movement? Once it is done, you have to click the button called 'Done' so that both videos will get synchronized. And then I can play the video.

You can see the video is almost synchronized, and we can proceed with further analysis. If you want to resync the video or if you want to edit the video, you can select the unlock button so that it will go back to the previous position where you have a separate timeline for each video. Once it is done, you can lock the video, and it will get synchronized. To make the visuals clear, I will make the video a little bit zoomed in, and at the top, you can see it is the title of the project, so I will change this to 'Qualitative Analysis.' We will go frame by frame to analyze the data. For now, we can minimize the montage and maximize the drawing pane.

You can use multiple tools. First, I would like to use the line tool. You can see the head is not in the same line. If you notice, in elite athletes, the trunk and the head are in the same line. And their view is between the hands. But on the left-hand side, the athlete is looking straight down, which increases the drag and minimizes the performance. You can make a hand still shot. So it will take a photograph of the specific frame. And it will be displayed in the montage.

Next, I am playing the **video frame by frame to understand the movement better**. You can see the power position. In the power position, the body is not in a straight line when you compare the video on the right side. The power position is not synced, but still, you can analyze it. You can see the power position; the entire body trunk and the head are in the same line going back. You can notice the right foot. I will place the marker. You can see there is a kind of parabolic path. Now let us check the elite athlete. How is their foot movement? If I draw a horizontal line on both foot movements, you can see that on the left side, the athlete has a higher foot movement when compared to the right. So I will take another still shot, and it will be placed over there in the montage. Playing the video further, if you notice very carefully, on the left-hand side, the athlete places the entire foot on the ground, which is the flat foot. With this simple video, we can analyze this much information from the biomechanical perspective.

As a biomechanist, if you wish to share the videos with the coaches and athletes, there are multiple ways to do that. The first method is to click export and share, and if you select one video, select where you want to export the video. If you wish to export the video to the computer, choose where you want to save the video, press next, and then publish it. The second option is the analysis recorder.

We discussed in the previous video how to share the recorded videos with annotations to the athletes and coaches. Close the presentation mode. Lastly, there is an option called montage.

So, what is montage?

It is a collection of videos and images arranged sequentially in one place. If you press the export and share button, again you have multiple options. If you click one video, you can either send the videos to Smart Cloud or Dartfish TV channel, or you can save the video to your computer.

[Next, we move on to StroMotion]

What is meant by **StroMotion**?

StroMotion allows us to capture multiple snapshots of a movement. And display them in a single frame or video. This helps us to see the different phases of motion in one clear sequence. For example, let us say we want to analyze a long jump. Instead of watching the entire video, StroMotion StroMotion can freeze key moments like takeoff, flight, and landing all in one image. This makes it super easy to study technique and performance for the coaches and biomechanists.

Why is StroMotion important for coaches and sports scientists?

It helps us to analyze the technique and see every phase of the movement clearly, and in addition, it helps to identify the mistakes and provide feedback for the athletes. Let us explore how to perform StroMotion, for that Go to the tools and select StroMotion. If you notice, initially we discussed that there are only five modules. The sixth module has popped up before the library, known as StroMotion. The first step is to drag the video into the screen. And then we need to identify which part of the clip needs to be processed.

For that, we need to cue in and cue out with the help of a small tool, which is the red-colored inverted triangle button. You can drag that button to the left and right to identify the cue-in position and then play the video forward until where you want to cue out. Once you have identified it, select the cue-out button. You can see the difference in the timeline.

The selected clip was highlighted in white color, and the remaining clip was in ash color. Once this process is done, click on next. You will be moving to compute camera movement. In this, we need to identify the two static objects in the background of the first image.

It will reflect on the second image, which is below. I will choose the first marker on the ring. You can see the reference marker also placed exactly in the same position. The second marker I will choose on the court, and you can see the same marker at the bottom. By your visual observation, if you find any mismatch in the marker, you can take the mouse over the marker. You can see the difference from the plus symbol. It is converting into a hand tool. Once I click the hand tool with the left mouse, I can drag that marker. Or if I select the right click, it will delete it. I will right-click again. You can see the markers are being deleted. So again, I am choosing marker 1 on the ring and marker 2 on the court. Once this process is done, we need to press the start button. [Before that, I want to make sure everyone understands]. I will drag this marker to a different place, which is not the same as the top. Similarly, I will move the second marker somewhere else. And then I will press the start button. You can notice that an error occurred during the process.

The two images do not have a sufficient common background. So these two markers are not matching. So what I am going to do is delete those markers. I am going to place new markers again on the ring, and on the court. Now, I press the start button. You can see now the video is calibrating. Once it is completed, we can do the visual check. It helps to check whether the visuals are successfully matched or not. Click on the visual check. The backgrounds of both images will be compared. If it is not moving abruptly, then it is successfully matched. Now, you can see the background is not moving, which means the camera is calibrated perfectly. Press OK and then go to the next image. You will go to Compute Panorama.

To construct the **panoramic background image**, press the Start button. It will take a few seconds to compute the panoramic image. Once it is completed, press the Next button. In this window, you can clone the images. For that, you have multiple tools on the right side and at the bottom. Let us explore it.

The first one is the **select tool**. In the second row, there is a **clone tool**. We can clone the object or a human using the rectangle shape, or you can use the **pen tool** to clone the object. In the third row, if you want to delete the clone which you have created, first choose the select tool and select the clone which you want to delete, then press the delete button. And on the right side, if you have multiple clones and if you press that, it will delete all the clones.

Next is the **magnifier tool.**

You can magnify the image and then clone the images. And to zoom out, you have to right-click the mouse so that the video will be zoomed out. At the bottom, you can play the video

frame by frame or you can jump the video every four frames, which will be helpful for cloning the videos. For this video, I have chosen a four-frame jump. You can modify it according to your own sport. If I take a 10-frame jump, it may miss some information, which is why it is always advisable to keep the numbers low.

Now let us clone the video using the rectangle tool. So I have chosen the clone button and I have highlighted a specific moment. Then I am pressing a few frames. Again, I am repeating the same. As a coach, you may need to identify key positions so that you can provide feedback based on these images.

So this is the last image. Once I complete that, at the bottom, you can notice the jump to the previous clone section and the jump to the next clone section. So this is the last clone. So that is why I will click on the previous clone. You can see the key images which I have chosen for this video.

Moving forward, there is an option called the **preview**. If I press the preview button, you may see how the images are arranged sequentially. If you feel anything needs to be modified, go back and click the **clone button**, and you can edit these images. If not, press the **publish button**. There are two options.

You can export the stromotion as still images or as a video. In this example, I will take it as an image. Choose where exactly I want to save the image. And then press next. So now your image is successfully published.

Press the close button. Let's go to the folder and check the image. As a coach or biomechanist, you can share this image and provide feedback to the athletes.

[Let us try another video].

The first step is to queue in and queue out. Identify the specific segment of the video. Once it is done, press next. The second step is to identify the two static objects in the background. One on the board and second one on the court.

Do the visual check. If you are satisfied, then press OK and then press the start button. It may take a few seconds. Once it is done, press the next button. The third step is to compute the panoramic image.

Press the start button. It may take a few seconds to complete the panoramic background image. Once it is done, press next. We come back to the final window to clone the images. So, I will use the rectangle tool to clone the image.

As we did in the previous video. We need to identify a few key positions. I made a mistake, so I will select delete this and then redo it. Landing image. Press the preview button to check the sequence. Once you are comfortable, press publish. This time, instead of a still image, we will go to the video, a stop-motion video, so it will convert into MP4 format. Press next again. It is asking where you are going to save the video. Press next. The video is successfully published. Press close, and you can immediately see the video. It has been downloaded and is showing in the tray. I can go to the edit module to play the stromotion.

Next, we will take another example where the player remains static. Then, how are we going to perform this stromotion? Following the same procedure, queue in and queue out. Press next, choose the two static markers, and then press start. To calibrate. Once it is done, do the visual check. If it is okay, then press next to compute the panoramic background image. Press the start button; it may take a few seconds. Once it is done, press next.

Now we are in the final window where we are going to clone the images. First, I will take the rectangle tool to clone this image. As and when the ball is released, I am going to use the pen tool. Exactly, I am going to draw around the ball. So, you can do the combination of both the pen tool and the rectangle tool.

Now, I press the preview button. You can see the first image, which I have taken with the rectangle tool, and subsequently, I have used the pen tool to identify only the ball. So, if you are satisfied with the sequence, you can publish it. Again, I will go to the video and press next. Identify the location and then press next. The video is successfully published. Close it. You can see the video on the tray. Go to the edit module, and then you can play the video.

[These types of stromotion will definitely help the coaches and athletes to understand where the exact flaw is and to enhance their performance].

[So, thank you and see you in the next video]