

Exercise & Sports Biomechanics
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Week 03
Lecture 12
Qualitative Analysis Software

[Hello, everyone! Welcome back to this course. In this video, we will explore the software for qualitative analysis. Though we are going to analyze the videos via software, visual observation is still the key to providing immediate feedback to the athletes. To be very clear, the video analyst or biomechanist cannot replace the coach's perspective].

Why do we need technology?

Based on research, coaches can only recollect 30% of the information correctly, and the remaining 70% depends on technology. That is why coaches are recommended to use technology in addition to visual observation. It not only helps the coach or sports scientist to review the video and get the depth of information, but it is also helpful for coaches and athletes to store the past performance of an individual athlete. For this, let me introduce the software called **Dartfish**. It is one of the most powerful tools for video analysis solutions to improve athletic performance. [Before going further, on behalf of the NPTEL team and Visva-Bharati, I would like to thank Dartfish for providing the software for the students. To my knowledge, Dartfish is the only software that performs both biomechanical analysis and performance analysis].

In the biomechanical analysis, there is a rule for placing the camera perpendicular to the plane of motion. In Dartfish, you can pan the video and still measure the data in 2D. That is the advantage of this software.

[Next, we move on to the system requirements].

For Dartfish to work without any glitches, they have recommended a few system requirements:

The first one is that Dartfish will work on the Windows platform with an 8th-generation processor. 16 GB RAM and an SSD of 500 GB. And when it comes to the GPU, Dartfish will support only Intel and NVIDIA. The AMD graphics card is not supported in the Dartfish software. These system requirements are on the higher end.

It is highly essential when you are going live with four cameras. But still, you can work with a lower version of all these functionalities. Maybe you can work with Windows 10, 8GB RAM, and less SSD. And a few of my colleagues have even worked with the AMD graphics card.

First, try to install the software and explore. If there are any issues, feel free to message in the question and answer section. The first step for the qualitative analysis is - we need to record the performance live, and we have to provide immediate feedback for the athletes.

So, there are multiple options where you can work with the live video feedback system. The first one is the **Aver Media**.

Any web camera or camcorder like Sony or Canon can be connected to the Aver Media via an HDMI cable. And from Aver Media, it will be connected to the laptop or the computer via a USB cable. Similarly, if you are using the AJA video system, you can connect via an HDMI cable or SDI cable, and to the computer, it will be connected via USB. The advantage here is, you can connect up to two cameras, but when you compare it to the Aver Media, it can only connect one camera.

If you want to use the Aver Media to connect two cameras, then you need to get two different Aver Media devices, and then you can use them in the Dartfish software. The last one is Blankom, where all the IP cameras can be connected, and it can connect up to four cameras. The input is an SDI cable, and to the computer, it will be connected via USB. If you do not have any of these devices, you can just use your laptop web camera to connect with Dartfish and still provide live feedback for the athletes.

[Next, we move on to the **software part**].

You have to Log in and register yourself on the Dartfish website using your registered email ID for this course. Once you have registered, go to your account, and from the dropdown, you can see the option called 'Subscription.' Below that, there will be options for 'Detail,' 'Manage Device,' and 'Download Application.' Once you click on 'Download Application,' you can see three different software options that can be downloaded to your system.

The first one is Dartfish 2024. It is clearly stated that it will work on both Windows 10 and 11. This is for your computer or laptop. For your mobile devices, you have MyDartFish Express and DartFish Note. These two applications are available on both Android and iOS.

Once you install the software, if you encounter any difficulties navigating through different modules, the first step is to check your GPU. For that, go to the settings. In the system display, choose 'Graphics.' Under 'Graphics,' you will have multiple devices. We need to choose Dartfish Publisher.

There will be a pop-up to choose between the Intel Graphics Card or NVIDIA. So, now you have to select the power-saving option, which works under the Intel graphics card. Save the option and try again. Most of the problems will be solved by this step. And lastly, if you have a video in the format of WMV or AVI, both are old formats.

You will not be able to use those videos in Dartfish. So, Dartfish has recommended a third-party software, which is open source, known as HandBrake. It can convert videos of any format into MP4 for Dartfish. H.264 encoding profile. This is the most important thing that makes the video appropriate to play in the Dartfish software.

Alternatively, there is an option in the Dartfish software itself. We can convert the video and use it for further analysis. Let us dive into the software. Double-click the icon. You will be able to see the entire workspace of the Dartfish software.

Let us first understand the skeleton of the software, which is the workspace, so that you will be more comfortable when navigating through different modules. At the top, you will find all the buttons. These are known as the Menu bar. In the second row, where all the modules are located, is known as the Toolbar. On the left-hand side, you can find the folder view exactly. You will be able to see all the folders that are there on your computer. I have specified one folder for this course, which is the NPTEL Dartfish video.

So, this is the folder view. Once I click on the NPTEL Dartfish video folder, you will be able to see the list of videos available in that particular folder. This is known as the item list. Below the item list is known as the tray. You will be able to see the entire black-colored screen, which is known as the video screen, where you can watch and analyze all the videos. At the top right corner, you can find different names, which are library, live, replay, edit, and present. Each one is considered a module in Dartfish.

Right now, you are in the library module, which is highlighted in yellow. On the left, you will be able to see the library section. In that, there are two options. One is the folder, which is already selected. From here, you will be able to navigate all the videos, and the second option is all videos.

If you choose that the library section is empty, there are a few buttons at the top. The first button is called 'New Category.' The second one is 'New Keyword.' Let me create a new category first. I will type 'NPTEL' and press 'OK.'

So, this is a broad category. Within that, I can create multiple keywords. The first one I wish to create is 'Basketball.' The second one is 'Running.' The third one is 'Hockey', and I can create multiple keywords. So, what is the purpose of this? Basically, I can tag a number of videos within a specific keyword. For example, if I press the button 'Show All,' you can see all the videos that are available on my laptop. I can drag all these videos into the specific keywords. For example, I will take the first one into basketball, the second one into hockey, and the third one into running. And I will take a couple of videos. For example, I am taking a couple of videos for running. So if I double-click on running, you can see only these three videos within that specific keyword. If I select only hockey, you can see a particular video that has been tagged within the specific keyword.

[Moving forward]

What is the role of the coach and sports scientist over here?

The first step is to create a broad category for competition and training. Further, as a keyword, you can identify what are the best performances and the bad performances. Similarly, during the training, what are the best and what are the bad performances. If you tag multiple videos within the competition and the training, later as a coach or a sports scientist, you can compare the videos and provide feedback for the athletes. This is the first step of the qualitative analysis which is Preparatory stage.

The next step is to **import the video**. There are **three different methods to import the video from the folder**.

The first one is you can double-click the video and you can see the video on the screen. The second one is you can drag the video onto the screen. And the third one is to drag the video into the tray. In all three different methods, you can import the video and start the analysis. Further, you can add multiple video files to the tray. If you notice, there are three dots on the tray. If you click that, you can export and share, you can remove the trays, open the tray which is already saved, or you can save the tray items. Now I am going to save the tray items as NPTEL for your reference. If I open the folder, you can see the NPTEL Dartfish file, which will help us to combine all four videos into a single file.

Going back to Dartfish, I will select the tray and then I will remove all the videos from the tray. I am going back to the three dots, then selecting the open tray item, and if I select the NPTEL which I have saved, now you can see all four videos. They are visible in the tray right now. Now, if you want to understand the properties of the video, in the tray, you have to right-click the specific video. Then, there will be an option called Properties.

You can select the Properties. Another window will pop up. As a biomechanist, it is very important to know the frame rate at which the video was recorded. So, this video is recorded at around 29.97 frames per second, and you can see the format of the video, which has a resolution of 3840 by 2160, and the most important thing is interlacing. If you double-click that, you can see multiple options.

So, what is interlacing?

Interlacing is a technique where each frame of a video is divided into two fields. You can see the two fields, Field 1 and Field 2, which are then displayed alternatively to create the illusion of a complete frame. For example, field 1 means that the first field of the interlaced frame will be displayed first, and if it is field 2, it means that the second field will be displayed first. But I recommend choosing the progressive. It is a method where each frame of a video is displayed as a single complete image. So, press apply and then click OK to see the changes in the Dartfish software.

Next, let us understand the **functions of these buttons at the bottom**. The first one is to play the video, and you can pause the video. The next one is the stop button. Wherever you are in the timeline, once you press the stop button, it will return to zero. That is the advantage of this button. I can fast-forward the video. I can make the video slower by using these two functions. If you notice, there is a number next to the stop button. If I right-click that, you can see different numbers above one and below one. Above one is where you can make the video much faster, and below one is where you can slow down the video.

When it comes to coaching, all the coaches would expect to see the video in slow motion to get the depth of information about the skill.

The next one is that you can play the video frame by frame. You can either go forward or play the video frame by frame backward. Clicking on the software will not be comfortable every time. For that, on the keyboard, if you press the control right arrow, you can play the video frame by frame, and you can use the left arrow to play the video backward. There is another option to play the video frame by frame, known as the jog wheel. You can see the

small dotted lines. Left-click the jog wheel. By pressing that, you can drag the video forward and drag the video backward for a better understanding of the movement.

The next one is the **set in and set out**. For example, in the initial part of the video, if I do not want the first few seconds, I can drag it up to that point and then press set in and play the video till exactly where you want to show it to the coaches or the athletes. For example, if I am stopping here, I can set out this point. You can see the empty space at the front and back, which will not be deleted completely. But for the reference of the coaches, it has been shortened for better visualization.

Next, If you notice at the bottom, it mentions that one item is selected, which means from the tray, only one video was selected, which is the basketball one, and it is reflecting in the video screen. If I select both basketball videos, you can see that two items are selected.

Here you can check the resolution of the video, which is full HD, and the frames per second, which was recorded at 30 frames per second. So in total, we have 4 videos in the tray. There is an option here for how the video has to be played, which are there in the tray. For example, the first one is play once to out point, which means the single video will be played to the end. The second option is play once to the end of the file.

We have four files in this tray. If I start with basketball one, it will end with swimming. So it will play all four videos one time. If it is a loop current, that particular video will be played again and again. If I press the play all button, it will play all four videos once and then it will stop. The last option is loop all, which means all four videos will be played once and then they will be looped again and again.

Next, you can see a camera symbol where you can take a snapshot of the particular frame. So, if I click that and go to PowerPoint and then paste it. From here, coaches and sports scientists can generate the report for the particular player.

The next one is the **volume function**. You can either mute the audio or play the audio. The last one is the full screen where you can see the videos on the entire screen.

Next, we move on to the **time parameters**. For biomechanics, as we discussed before, time is a crucial factor in analyzing the performance of an athlete. Here, for example, the total video length is 9.7 seconds. So, if I double-click that and then give 4.3, the video will go exactly to the 4.3-second mark. And there is an option; there are three dots at the right corner. If you click that, you can see multiple options. If I click the seconds, you can see that out of 9 seconds, the video is now in the 4th second. If I click the tenth of a second, you can see one decimal point. If I select the hundredths of a second, you can see two decimal points. If I select the millisecond, you can see three decimal points. For time-related sports, these parameters will help coaches and biomechanists understand the movement better.

Initially, we trimmed the video at the front and the back. So, if you want to save this trimmed video, go to the option called 'Save Trimmed Video.' It will ask where you want to save it, and then press next. So, it will convert the video. It will save the video, and you can see it in the tray.

Now we have five videos. And lastly, in the library module, you can zoom in on the specific movement for better visualization, or you can zoom out.

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