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USING MOTION ANALYSIS SOFTWARE TO GATHER SPORTS EXPERIMENTAL DATA

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Abstract: *In this paper we will describe the way experimental data captured by a cheap and portable motion analysis system dedicated to amateur and juniors sports (developed mainly for athletics) can be gathered and analyzed using common, easy to access software. We will present things related to how the data is collected, stored and analyzed in order to improve the young athletes performances.*

Keywords: *motion analysis, biomechanics, sports software*

1. INTRODUCTION

When we choose a cheap and portable motion analysis system in order to use it to capture, gather and analyze data for athletic disciplines and medicine (most likely rehabilitation medicine) we were aware that we will need some form of software to be able to transform the video materials (the videos of athletes performing) into raw experimental data, and some other software which would be dedicated to process the raw experimental data into mathematical models which would define the athletic discipline or the medical condition. When choosing such a software, we had to take into consideration the same principles we had when we choose the physical motion analysis system: it has to be some common, easy-to-access software that everyone can buy, it has to be easy to use and understand (as probably the benefactors - likely an athlete and his trainer - will not afford a dedicated person just for the motion analysis part), it has to have a decent price (educational offers were a plus) and it has to have the possibility to export the data to some very common format (we were looking for Excel compatibility). For this, we ended up having to choose between Kinovea (which is a free software recently developed), Dartfish (well-known motion analysis software) and Adobe After Effects. We choose the later, because it is developed by a giant in the software industry (Adobe), has a decently low price, it is easy to use and the data can be transferred in Excel format (but requires some work).

2. MEANS AND METHODS

Unfortunately, Adobe After Effects is not a software purely dedicated to motion analysis - in fact, just a small module of the application takes care of that. We are interested in the coordinates of the markers in motion, while the people who usually use Adobe After Effects for its main purpose (creating effects for video materials) are usually

not. The whole job of extracting the motion's raw data from our sports videos into a general format follows some not-so-obvious routine which we will present here (that's one of the main reasons of this article's existence). After having the application installed, all the codecs installed (especially QuickTime), the process, step by step, consists in this:

- The video is imported in Adobe After Effects
- The video is then dragged to the Composition area
- The Track Motion tool is chosen from the Animation tab in the menu bar
- The Track Motion element is then set up so that the marker is contained in the first square (the inside square) while the outside square is dragged to a decent size around the first square - all this is done while making sure that the + in the middle (called "attach point") remains in the center of the marker and of the inside square)
- The Tracking Motion menu (on the bottom right) is then set up (we usually go for a RGB approach, instead of luminosity, and also we choose Track Fields, but that is up to everyone to try different settings, to see which one works best)
- The Track Motion is then activated, the marker will (hopefully) be followed through the whole motion by the tracking tool and we will obtain a trajectory, easily visible on the screen

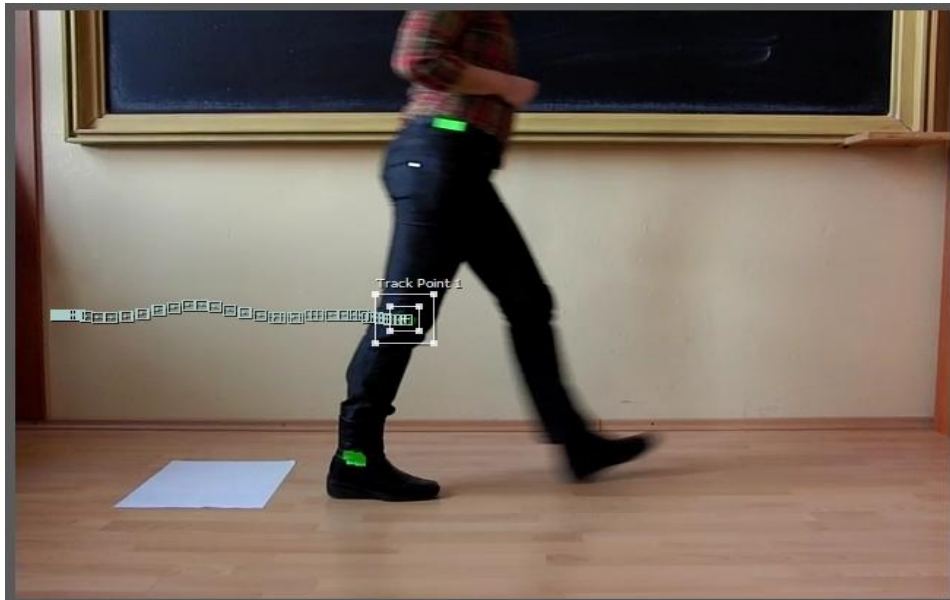


Fig 1. The Track Motion tool, which follows the trajectory of the marker

- The low right corner area should be accessed after the motion is finished - there, we choose our motion tracker and go down the menus until we get to Attach Point
- We select attach point, and the color of the frames is changed to yellow

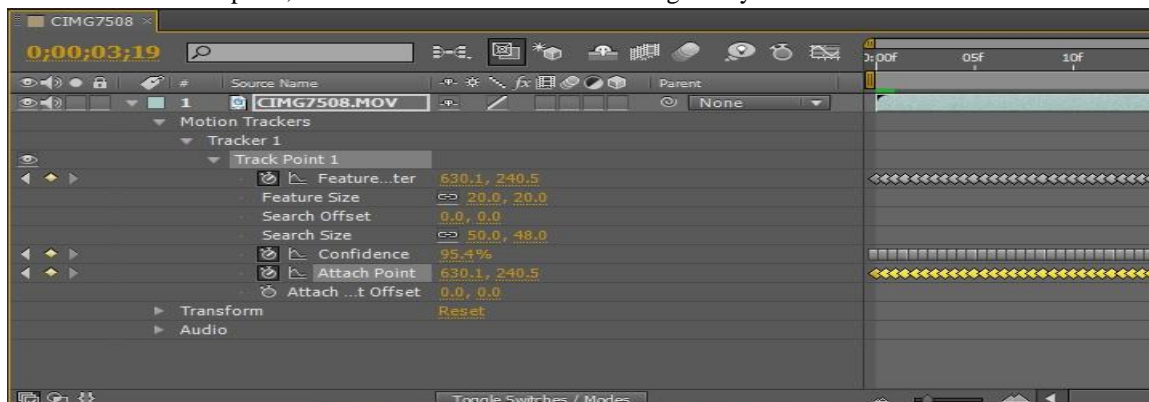


Fig 2. The yellow Attach Point data, which must be copied to Excel

- We copy the frames (Ctrl-C) and paste them into Excel
- The frames come with a lot of residual data - we have to manually clean each Excel file in order to be able to process the frames (we want to obtain clean Excel files containing only the coordinates of the markers frame by frame)
- We have our Excel files now, we must make sure that the format of the data in the columns is set to Number and we also have to make sure that the numbers format which we use is the US one (using point as a decimal separator, and not comma) - this is because we need to process these files using MATLAB

3. CONCLUSIONS AND FUTURE WORK

In this article we just presented a possibility to obtain motion data in sports working with a non-professional motion analysis system and a very common video processing application. We end up obtaining experimental data (marker coordinates) from the raw videos using only easy-to-access hardware and software, which is the aim of all our motion analysis research - to provide the athletes and their trainers easy to use, cheap and non-proprietary tools which they can take advantage of in the process of improving the athletes performance.

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