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GATHERING MOTION DATA FOR A REAL-LIFE GAIT ANALYSIS SYSTEM

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Abstract: In this paper we will describe a method for collecting motion data for a Gait Analysis system with markers, developed for real-life situations. We will present the methods used for gathering the marker's coordinated directly from video materials and the ways in which those coordinates can be stored in a database.

1. INTRODUCTION

When building a system for Gait analysis, usually the developers take into consideration domains like sports and medicine. In sports, Gait analysis is used in order to to improve competitor's performance by modifying their movement. That technique is common and it can nowadays be found in every high-performance sportive environment. In medicine, Gait Analysis is used in order to help people regain or improve their walking abilities, following what is considered to be „a perfect model" for walking. In forensics, Gait Analysis is important considering the aspects of stability and uniqueness of human walking. There are obvious differences between Gait analysis systems used in sports and medicine and those used in forensics. If in the first two situations laboratory analysis is possible (and highly recommended), Gait analysis in forensics implies real life situations, therefore the laboratory approach is impossible.

2. FOLLOWING THE DATA IN A GAIT ANALYSIS SYSTEM

Regardless of the domain of interest, a Gait analysis system has two major components: a hardware component, consisting of video recording devices and reflective markers, eventually external machines used to alter the environment (luminosity, color etc.) and a software component. The software component can also be classified into two different areas: one which deals with the extraction of the motion data from the video materials and the other which has the role of processing and analyzing of the extracted data in order to obtain results. Roughly, the process starts the video recording of a human's motion, continues with the collecting of data from video materials and ends with analyzing that data and presenting some results.

3. APPLICATIONS TO COLLECT THE MOTION DATA FROM VIDEO MATERIALS

Considering the objectives of this article, we will presume that we already have the video captured materials from the first step of Gait analysis. For the methods using markers, the coordinates of those markers are the points of interest for the researchers (analysts). To obtain those coordinates, we need applications able to follow the markers during motion and return the coordinates of the markers, frame by frame. In our analysis we had four main applications which (to some extent) fulfilled this task: Dartfish, Mocha, Adobe Premiere and Adobe After Effects. To select the most suited software application for our project, we used a Multi-Criteria Decision Analysis. The criteria taken into consideration were Compatibility, Efficiency, Adaptability, Precision, Presentation and Results. Compatibility has to do with the type of files that the application is able to work with. Efficiency is represented by the way the application uses to follow the movement, the marker recognition technique used. Adaptability means the possibility to recover the trajectory when eventual errors occur. Precision deals with the influence of external factors such as luminosity, color saturation etc. Results and Costs is the last criteria and deals with the way which the program is using in order to present the data, the application's costs and popularity (a popular software utility usually benefits of regular updates, better support,

compatibility with other popular software). Considering the criteria presented above, we choose Adobe After Effects to be used during this research.

4. GATHERING MOTION DATA USING ADOBE AFTER EFFECTS

The first step is loading the video material into Adobe After Effects. Afterwards we will use the build-in tracking tool in order to follow the marker's trajectory during motion. The tracker tool has two rectangular areas, an outside and an inside one. In a frame-by-frame approach, the application analyzes the differences between the areas in order to compute the position of the marker.

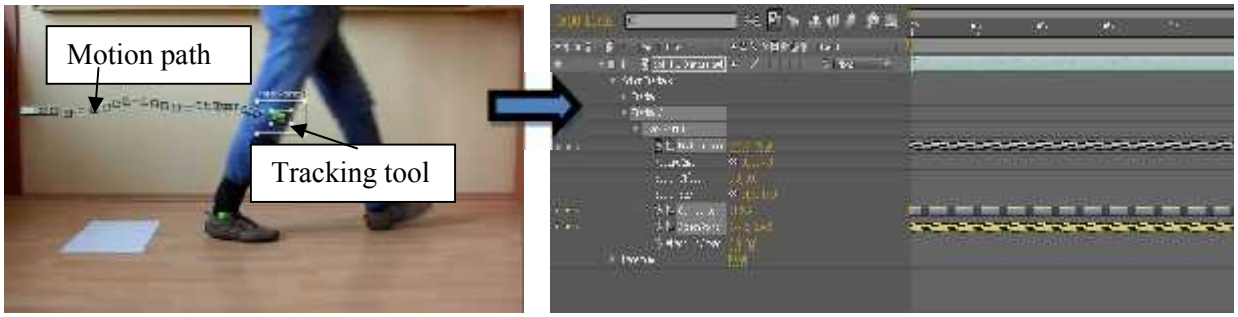

Figure 1. Tracking the motion and extracting the marker coordinates in Adobe After Effects

On the marker, a point „+" is set. This point is named „anchor point" and its coordinates are the ones which we will follow in our analysis. The coordinates are written in the anchor point area on the screen, and from there they are stored in Excel tables using copy-paste approach.

5. CONCLUSIONS

Gathering motion data for a real-life Gait analysis system proves to be a difficult task. From the software utilities which we tested, Adobe After Effects offered the best results. We presented the technique for obtaining the motion data using Adobe After Effects, starting from data extraction from the video materials and ending with data storage.

6. FUTURE WORK

We aim to use the motion data extracted with Adobe After Effects in order to identify a person from a database. We will need to find the parameters which make the human motion stable and unique for each individual and then use those parameters to perform the human identification. In the end, we plan to offer a standardized solution for human identification using Gait analysis, with applications to forensics.

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