VALIDATION OF A MODEL BASED IMAGE-MATCHING TECHNIQUE FOR 3D MOTION RECONSTRUCTION FROM UNCALIBRATED 2D VIDEOSEQUENCES

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Introduction

At present the existing methods for analysing injury situations from videotape are unsatisfactory. As injury situations cannot be reconstructed in laboratory tests, particular interest lies in utilizing videos for biomechanical analyses.

The aim of this study is to present and validate a model based image-matching technique for 3D motion reconstruction by use of uncalibrated 2D video sequences.

This study is presently ongoing, and preliminary results seem promising regarding the validity of the method.

Materials and Methods

Different motions, including high impact motions, low impact motions and static poses of different complexity will be subjected to motion analyses by the means of:

- A traditional gait lab with a optical 3D tracking system (ProReflex, Qualisys Inc.) and 2 force platforms (AMTI)

and additionally:

- 3 ordinary VHS video cameras

3D kinetics and kinematics from the recorded motions will be calculated from the ProReflex system and force platforms, which will yield the “gold standard” for this experiment. Motion estimates and kinetic variables will additionally be derived from the videotapes using a model matching method based on a commercially available 3D animated human model (Poser, CuriousLabs Inc.) In the Poser interface one video sequence (or two synchronized sequences) is imported to the background for the animation model. The model is then manually fitted to each of the background pictures. The kinematics and kinetics of the different trials will be compared between the two methods, while using one camera, 2-3 cameras, different framerates and projection angles (including camera panning). In addition, inter- and intra-subjectivity analyses will be performed.

This novel approach for 3D biomechanical analyses from 2D videosequences will hopefully provide some of the information presently lacking in injury mechanism analyses such as a description of the net joint kinematics and kinetics involved in non-sagittal motions.