Applikationsentwicklung Bewegungslabor

In human motion analysis, handling a large quantity of data is necessary to report biomedical outcome measures. It has been requested from the physiotherapy research group of the Bern University of Applied Sciences BFH, to develop a consolidated and user-friendly software. It has to cover the workflow from reading and analysing acquired data to exporting for post-processing with statistical analysis software.

Background

The movement laboratory of the Bern University of Applied Sciences BFH is equipped with a broad palette of measurement equipment to assess human motion. This ranges from optical motion capture for measuring movements in 3D (Fig. 1) to electromyography for assessing the muscular activity, the cause of any human movement. A resulting biomechanical analysis can support the fitting and improvement of orthotics, help to plan orthopaedic interventions or aim to assess and develop physical therapy regimens.

Problem

Extensive biomechanical assessments lead to a considerable amount of data and reaches a relatively high degree of complexity. Processing and analysing data, ending up in a comprehensible report can be a tedious process. Several separate routines to analyse and report data coming from different instrumentations were recently developed with Matlab. The biggest issue is the fact that the solution is fragmented and hard to maintain and expand. This demands consolidated software, that is easy to use also by non-technical users and that is modular and expandable for implementing new biomechanical analysis routines.

Solution

The Movement Laboratory Application (MOLApp) was requested to have high scalability, modularity and if possible to be platform independent. The program is built on the Qt framework (C++) and several task specific open-source libraries (Fig. 2). After data acquisition, data can be imported in MOLApp and is available in a tree structure, from where it can be analysed and exported for further post-processing with statistical software packages. It is as well possible to generate a report for interpreting the biomechanical analysis. The program is written in order to be easy expandable by other programmers. In this way it will be possible to conver future necessities.

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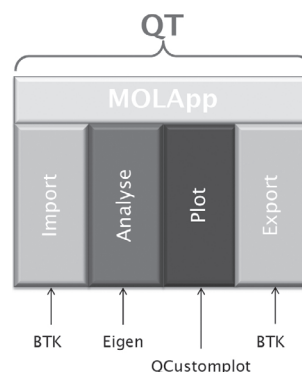Figure 1: 3D motion capture in the movement laboratory

Figure 2: Block diagram showing the principal components of MOLApp: IDE on top and libraries at the bottom.

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