MANUAL SKILLSPECTOR

Adaptado por Prof. Dr. Guanis de Barros Vilela Junior

RESUMO PARA ANÁLISE CINEMÁTICA 2D

1) Filmar um movimento locomotor que ocorra principalmente em um plano (exemplo: plano sagital). Na filmagem filmar a referência física que será utilizada na calibração.

2) Para efeito de calibração, é recomendado usar eixo ortogonal rígido (metal, madeira, plástico, etc) ou uma cartolina colada em um fundo de isopor ou madeira. Marcar no referencial adotado as seis coordenadas (x e y). Por exemplo, seis pontos eqüidistantes distribuídos na cartolina.

3) A filmagem do calibrador e do movimento tem que ser realizada sem alteração da posição da filmadora e no mesmo arquivo.

4) O sujeito filmado tem que estar no mesmo local onde foi filmado o calibrador.

5) Antes de filmar ajustar o foco e enquadramento adequado para a análise.
6) Escolha um gesto locomotor que seja de curta duração (exemplo: uma flexão).
7) Se a filmadora não salvar o arquivo no formato *avi*, o mesmo deverá ser convertido para este formato. Na internet existem vários conversores gratuitos.
8) O sujeito filmado deve estar de roupa preta colante onde são marcados em branco, com fita adesiva, os pontos articulares de interesse para a análise cinemática.
9) Iniciar o software com uma *New Sequence.*
10) Adicionar o vídeo (avi); calibrar, ajustar vídeo (interlace ou não); digitalizar e analisar (linearmente e angularmente).

SkillSpector

Introduction to Motion Capture and Analysis with SkillSpector

Video based movement tracking/analysis is composed of six simple steps.

Step 1: Recording of the movement event by use of standard video camcorder. In case of 3D tracking the use of two or more cameras is required.

Step 2: Starting the SkillSpector with a new Sequence. The use of Wizards is possible and facilitate the ease of setting up the sequence parameters. Major parameters is the Digitizing Model and the image calibration setup.

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*The **Digitizing Model** defines the points, objects and segments of the human body that is of interest. By having two points like ankle and knee a segment named calf (lower leg) can be defined. Points does not always have to relate to the human body but can also define other objects like golf club, ladder in high jump, football in kicking and so on.*

*The **Calibration setup** is the method by which the image is transformed into a standard coordinate system as we know it from mathematics with X, Y and Z axis with measuring units of meters or centimeters.*
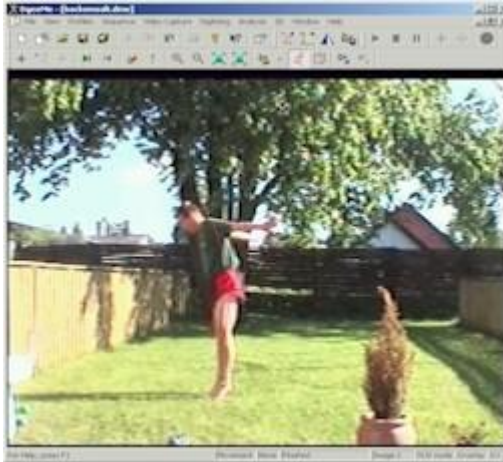

Step 3: Capturing of the video sequence onto the computer harddrive using video capture hardware. SkillSpector support most compatible video/TV capture hardware and will try to adjust in order to comply with the newest hardware available. Support for digital camera (DV) has all ready been suggested and has been taken into account.

Step 4: Digitizing of the movement by locating the specific reference points of the human body. SkillSpector is capable of searching for specific location in the image by the means of image processing. This means that after manually digitizing the toe the first time the software will try to relocate the new position in the next image. In some situation it is very powerful and enhance the speed of digitizing. Various settings can be adjust in order to facilitate the speed. In order to increase the accuracy of digitizing the SkillSpector uses a special SneakZoom feature that fast and easy supports subpixel accuracy. Subpixel accuracy (see picture below) is done using fast image interpolation and is not just a zoom (increase of pixel size) feature like most software I capable of today.

Digitizing 2D versus 3D: In many movement analysis the use of 2D is more quite sufficient. The decision whether to do 2D or 3D is solely a question to the nature of the motion. In this shown example (back summersault) the main movement is in one plane i.e. the sagital plane. A 2D analysis is therefor sufficient. A good thing to always keep in mind when doing motion analysis is to keep it simple in order to avoid errors and factors that don't relate to the actual movement.
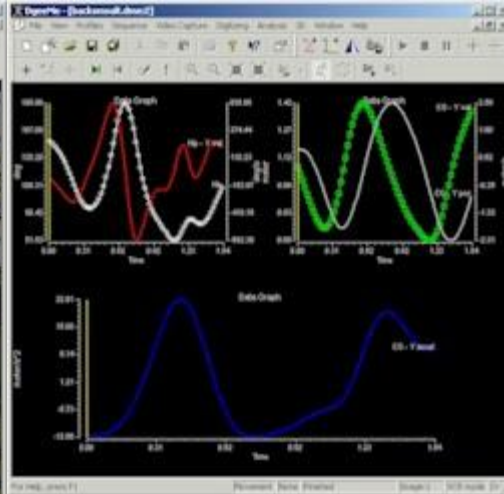
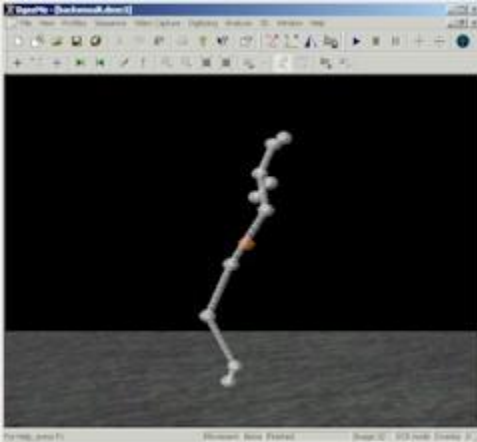**Step 5:** Digitizing the calibration that maps the world coordinate system into image. SkillSpector is capable of using three different methods of calibration. A 2D posture calibration like the one shown in the picture on the right, a 2D calibration frame and a 3D calibration frame. The calibration frame has to be digitized in every camera view included in the sequence. Important for the calibration setup is to know the actual absolute world coordinate positions of all the calibration points. If great inaccuracy is made with the calibration points it will affect the accuracy of the actual movement measured.

Step 6: Now to the analysis and all the fun. In Game development the movement data will be exported to another software and used for defining character movement.

In the picture on the left it is the analysis of Center of gravity movement during the back summersault performed. It also includes the angle and angular velocity of the hip.

The picture on the right shows a 3D computer graphics representation of the movement. The movement can be replayed at different speeds. The orange point in the is the center of gravity. This representation of the data is pretty similar to 3D games only that this would properly be a monster character with a sword fighting you until his death. Happy analysis and gaming!

Features

Here is just a small list of features of the SkillSpector software:

- Video capture (VFW)
- Transformation of both 2D and 3D motion.
- Vision technology to guide the digitizing process
- Extremly fast scrolling, zooming and general image navigation
- SneakZoom using image interpolation in order to have high digitizing accuracy
- Use of human model profile data base for fast creation of new sequence
- Use of Calibration Object data base for fast access to common used calibrations
- Wizard to help creation of new sequence, human models and calibration objects
- Semiautomatic digitizing
- Automatic digitizing with and without markers
- Semiautomatic digitizing
- Analysis of motion parameters
- Increase of digitizing speed by enable static and missing points status
- OpenGL rendered animation
- Image processing to enhance the digitizing process
    - Effects: blur, sharpen, median, gassian, edge detection, morphological filters
    - Definition of Range of interest to speed up image processing
- Motion Data filtering
- Handling of interlaced video and high speed split images.
- Transformation based on DLT (Direct Linear Transformation) concept
- Fast 3D digitizing
- and much more to come! Try it out!

Tips and Tricks

This page is a small short cut to some of the features in SkillSpector, and how to improve the speed and accuracy of digitizing:

1. Fast Image scrolling (Ctrl key + left mouse button)

When zooming in an image you normally end up with only a fraction of the actual image. In order to find or navigate in the image you are forced to use the scrolling bars on the right and in the bottom which is often pretty slow. As a special feature in the SkillSpector you can click the Ctrl button on the keyboard and at the same time click with the left mouse button in the image and hold it down. Moving the mouse will scroll the image.

2. SneakZoom

When digitizing you normally use the zoom to get a higher resolution. In SkillSpector you have a feature that is called a SneakZoom, which enables zoom of a small part of the image just below the

3. Edit Digitized points

Position the mouse cursor close to the point that has to be changed. Click the Shift button and click the left mouse button and hold it down. Relocate the position and release the mouse and shift button.

4. Define Range of interest in the Image

Range of interest is used to speedup the image processing part. Instead of applying image filters to the whole image you can define a Range of interest (which is a rectangle). Position the mouse cursor in the corner where the ROI has to begin (top/left corner). Press the Shift and Ctrl key on the keyboard and click with the left mouse button and hold it down. Move the mouse cursor to the end corner (bottom/right) and release the Shift, Ctrl and the mouse button

mouse button. The idea with the feature is to locate the approximate position where the point has to be digitized and then click the left mouse button but keep holding it down. After just 0.3 sec a small zoomed part of the image will appear and you are enabled to digitize in a much higher resolution. If the middle mouse button is used for digitizing there is no delay before the zoomed image part is displayed. It is possible to set the SneakZoom in the Digitizing Menu. The difference between the standard zoom and the SneakZoom is that an interpolation is used for the SneakZoom.

Whats New (Changes)!

Date 16/03-2006 (only 1.0bBeta Version)

VFW removed and added support for DV capture. Video Overlay analysis for comparisons studies (scaling, repositioning and zoom under dev). Simplification of GUI and image processing. Few

Date 29/11-2001

Few bug fixes and new features added. Adjustment of human model properties, fast statusbar scroller, grids in Data Window.

Date 24/04-2001

Support for high speed split video images, Viewing of DLT parameters. A bug in the

bug fixes.

Date 17/06-2005

DV and Hyper High-Speed Recording and Pro-Slow Playback support

Date 14/05-2002

Changed SkillSpector from shareware to freeware and fixed a few bugs.

Date 23/04-2002

Fixed problem with automatic digitizing using skipfactor>1

Date 14/04-2002

Fixed several bugs. Added fast switching between views with Tab. Dynamic menus for easier selection of views. Improved 3D digitizing. Automatically enable video open when adding new view.

Date 15/03-2002

Fixed several bugs and problems.

Date 11/03-2002

Fixed problems with calibration setup. Added persitent windows. Locking of

video display under Win98 has been solved.

Date 03/15-2001

The scrolling and zooming has been improved for faster navigation in the video image. Parts of the help documentation has been added and been switch from old Help Doc to HTML Help doc.

| multiple views. Sync image. | |