BIOMECHANICAL Integration Of Essential Human Movement Parameters and Technology for 3D Gait Analysis

By

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MOVEMENT ANALYSIS CAN BE APPLIED TO:

- Athletics
- Industry
- Medicine
- Space
ALL APPLICATIONS UTILIZED SIMILAR QUANTIFICATION TECHNIQUES
Basic Components of Motion Analysis System

- Notebook computer
- Portable VCR
- External monitor
- Portable printer
- Video cameras
- Force plate
- EMG
- Optional A/D devices
Analysis of Performance Requires:

**Video Recording**

**Digitizing the Data**

- Manual
- **Automatic**

Transformation of the Data

- 2D - Two Dimensional
- 3D - Three Dimensional
Hardware

- **Main Computer System**
- **Workstations**
- **Capture Card**
- **Network**
  - Intranet
  - Internet
    - Renderer
    - Presentations
High Speed Camera at 240 Hz
Video Capturing System
Video Capturing Software Packages
Display and Analysis
Software Integration
Software Integration

- Capturing
- Digitizing
  - Locally
  - Net Digitizing
- Transformation
- Filtering
- Kinematic Results Display
- Kinetic Results Display
IN-SHOE Pressure Distribution During Running (3.3 m/s)
(2 Types of Footwear / 22 Subjects)

SHOE A

PACC = 7.8
PRON = 9.3
PVEL = 560

SHOE B

PACC = 6.3
PRON = 12.2
PVEL = 570

PP = 1020 kPa
PP = 830 kPa

BIOM-ESSEN / Hennig
910 kPa

10 ms
PROVIDE SIMULTANEOUS INTEGRATION OF:

- Video Images,
- 3-D Stick Figures,
- Kinematic & Kinetic Data in graphic/tabular format,
- Analog information from force plate & EMG data
Technological advances have made it possible to integrate, synchronize, and simultaneously display video records, kinematic, kinetic, EMG, and force plate data of human movement.
Real-time rendering

Traditional stick figure

Real-time rendering
What is Rendering anyway?

Definition of:
- Graphic objects
- Lighting
- Environmental effects
- Behavior
- Physical characteristics

Calculate views:
- Computer screens
- Immersive workbench
- Head-tracked glasses
Gait Analysis with Markers Sets

(A) Anterior View
(B) Posterior View
The Future – The Virtual ISBS

• Virtual Biomechanic Desk

  • Locate and download your favorite Biomechanical Data from one convenient, easy-to-use interface.

  • Software that allows users to share Biomechanical libraries with each other no matter where they are located. Virtual Biomechanics provides a search capability for videos, 3D/2D Files capability for users to communicate in forums of like interest.

  • Each Biomechanist is a download/upload source

  • Each User Computer, when it is on, it becomes a shared directory

  • For more information: http://www.arielnet.com
Virtual Biomechanics
The Future

• A user records and stores Video file in a specific folder on his or her hard disk
• A central directory maintained by Biomechanics.com keeps track of which users are logged on, cataloging by title and researcher/biomechanist the activity in each user’s special folder
• A user searches through the Biomechanics.com directory for a desired activity or sports. Once the activity is downloaded it can be used for further analysis or observation. This file can also be sent to another person as e-mail or attachment
• Any user folder can be shared with the rest of the World
• Biomechanics.com monitor and publish the catalogue of activities and sports world wide
The e-Golf Reports (or e-Reports) will be one of the most important technical factors of the system. With these reports, users should be able to understand their mistakes. Users will be able to improve their skills by interacting with e-Coaches, keeping records of progress, get on-line update recommendations for training, design training programs, obtain third party intervention, track progress and learn online through real-time interaction.