Biomechanical Integration of Essential Human Movement Parameters

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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
- Video cameras
- Force plate
- EMG
- External monitor
- Portable printer
- Optional A/D devices
Analysis of Performance Require:

**Video Recording**

**Digitizing the Data**

- Manual
- **Automatic**

**Transformation of the Data**

- 2D - Two Dimensional
- 3D - Three Dimensional
Technological advances have made it possible to integrate, synchronize, and simultaneously display video records, kinematic, kinetic, EMG, and force plate data of human movement.
Hardware

- Main Computer System
- Workstations
- Capture Card
- Network
  - Intranet
  - Internet
    - Renderer
    - Presentations
Hi Speed Camera at 240 Hz

GR-DVL9500U
LCD Monitor VHS Camcorder
Video Capturing Software Packages
Video Capturing System
Software Integration
Software Modules

APAS System

Ulead VideoStudio 4.0.Ink
Shortcut

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Software Integration

- Capturing
- Digitizing
  - Locally
  - Net Digitizing
- Transformation
- Filtering
- Kinematic Results Display
- Kinetic Results Display
Transformation

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Data Transformation
Filtering/Smoothing
Display and Analysis
PROVIDE SIMULTANEOUS INTEGRATION OF:

- Video Images,
- 3-D Stick Figures,
- Kinematic & Kinetic Data in graphic/tabular format,
- Analog information from force plate & EMG data
Program Integration and Synchronization
PROVIDE SIMULTANEOUS INTEGRATION OF:

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Applications

- COACHING
- SPORT PERFORMANCE ANALYSIS
- OPTIMIZATION OF PERFORMANCE
TECHNIQUE COMPARISONS USING VIDEO DISPLAY
Discus Throwing Analysis Using Video Viewing Option

**Video View**--The video viewing function permits the biomechanist to observe a sport or functional movement from multiple perspectives, simultaneously. This allows the coach or clinical to perform sport or clinical evaluations at sampling rates that may be 2-10 times faster than visual observations depending on the video cameras transport rate.
Gymnastics Techniques Comparison of Backhand Spring & Flic-Flac Using Synchronized Views

Sync View--The synchronization function provides the capability of performing a comparative study of two separate trials or different movement techniques in a side–by-side analysis format.
Integrated View--The viewing option permits the user to examine the kinematic / kinetic data of the human movement simultaneously with the data point trajectory and the corresponding video frame from multiple cameras). This feature of creating dynamic outputs may be used in performing simultaneously qualitative and quantitative analyses for sport performance.
High Jump Analysis Using Integrated Data Option

Data View -- The data view is capable of showing many different kinds of numerical data parameters, such as, displacement, velocity, force, EMG and so on. Each channel loaded can be manipulated numerically in order to normalize and modify the data. Each individual data channel can utilize a unique color and a label can be added. The data view can present the data in three different formats, namely, line graphs, bar graphs and numerical table values.
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
The Future – The ISBS Virtual

• 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. ISBS_virtual 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
The Future

- A user records and stores Video file in a specific folder on his or her hard disk
- A central directory maintained by ISBS.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 ISBS.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
- ISBS.com monitor and publish the catalogue of activities and sports world wide