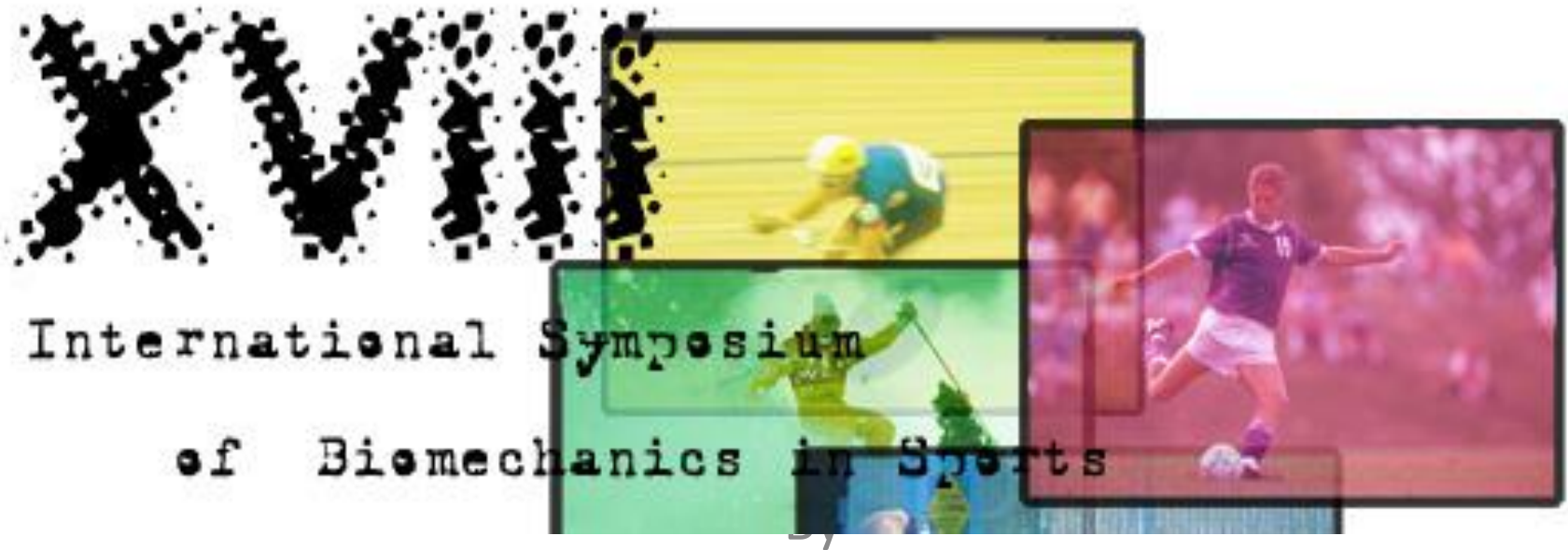
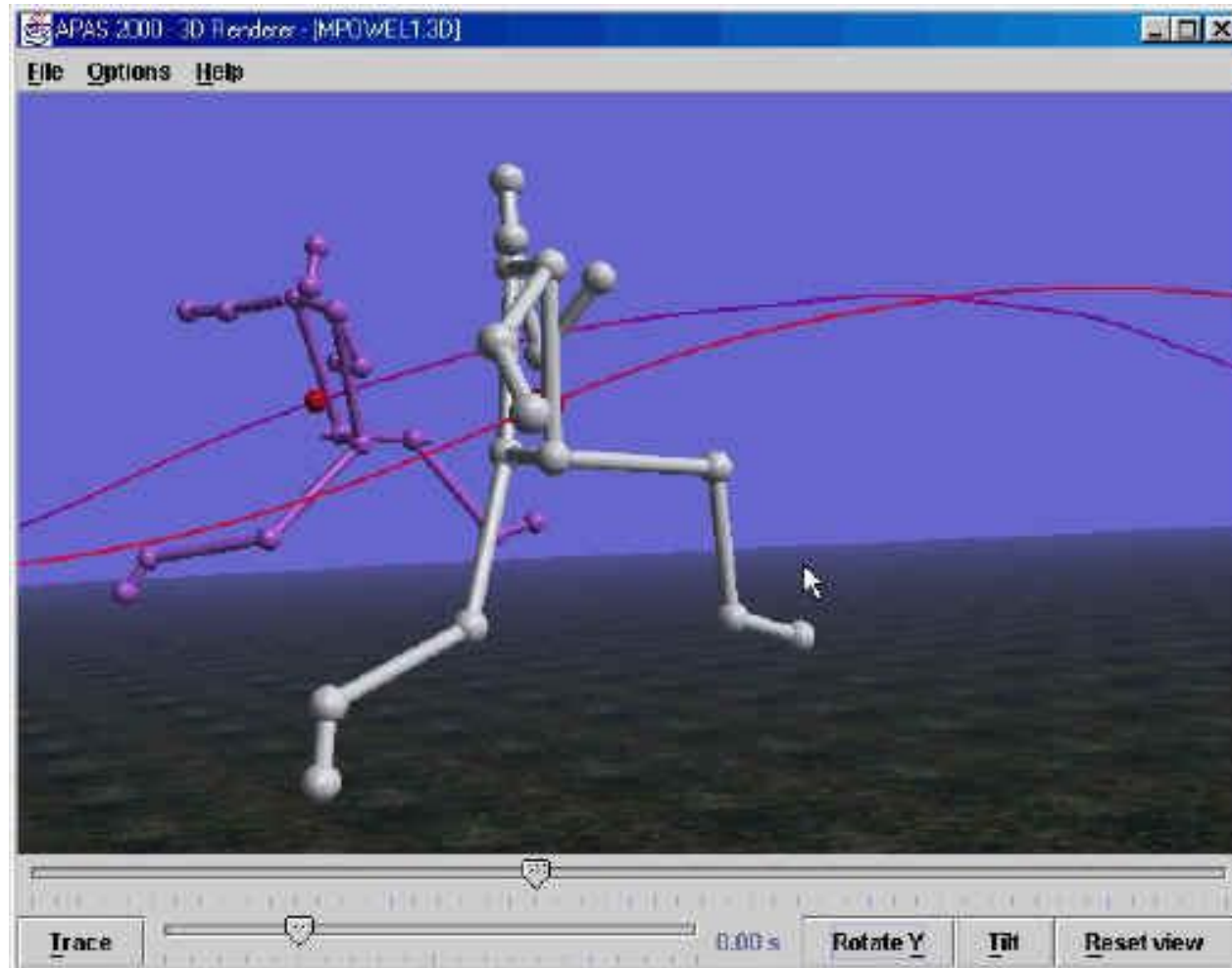


# Biomechanical Integration of Essential Human Movement Parameters



Gideon Ariel, Alfred Finch and Ann Penny

# MOVEMENT ANALYSIS CAN BE APPLIED TO:



Athletics

Industry

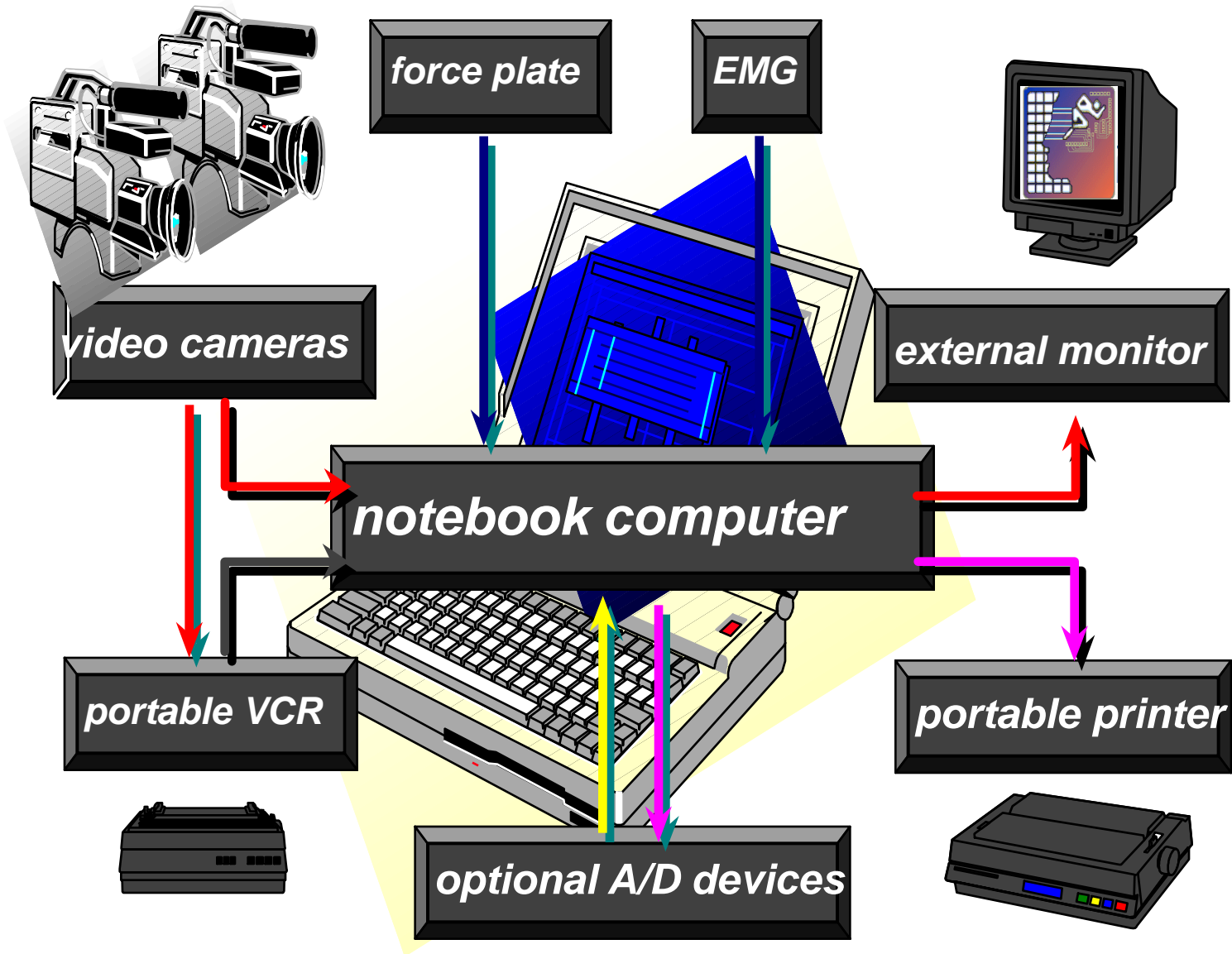
Medicine

Space

# ALL APPLICATIONS UTILIZED SIMILAR QUANTIFICATION TECHNIQUES



# ***Basic Components of Motion Analysis System***



# **Analysis of Performance Require:**

**Video Recording**

**Digitizing the Data**

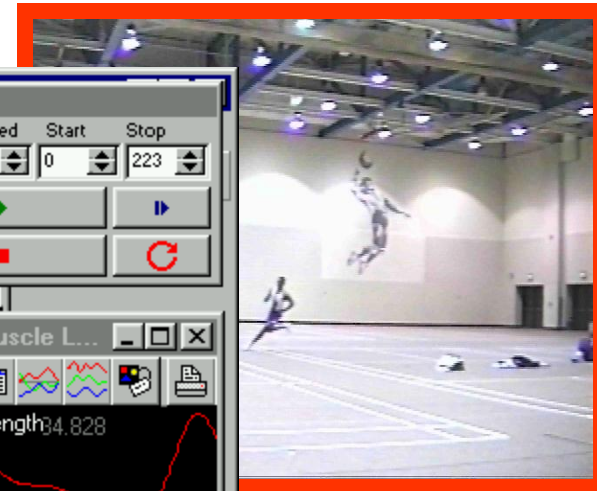
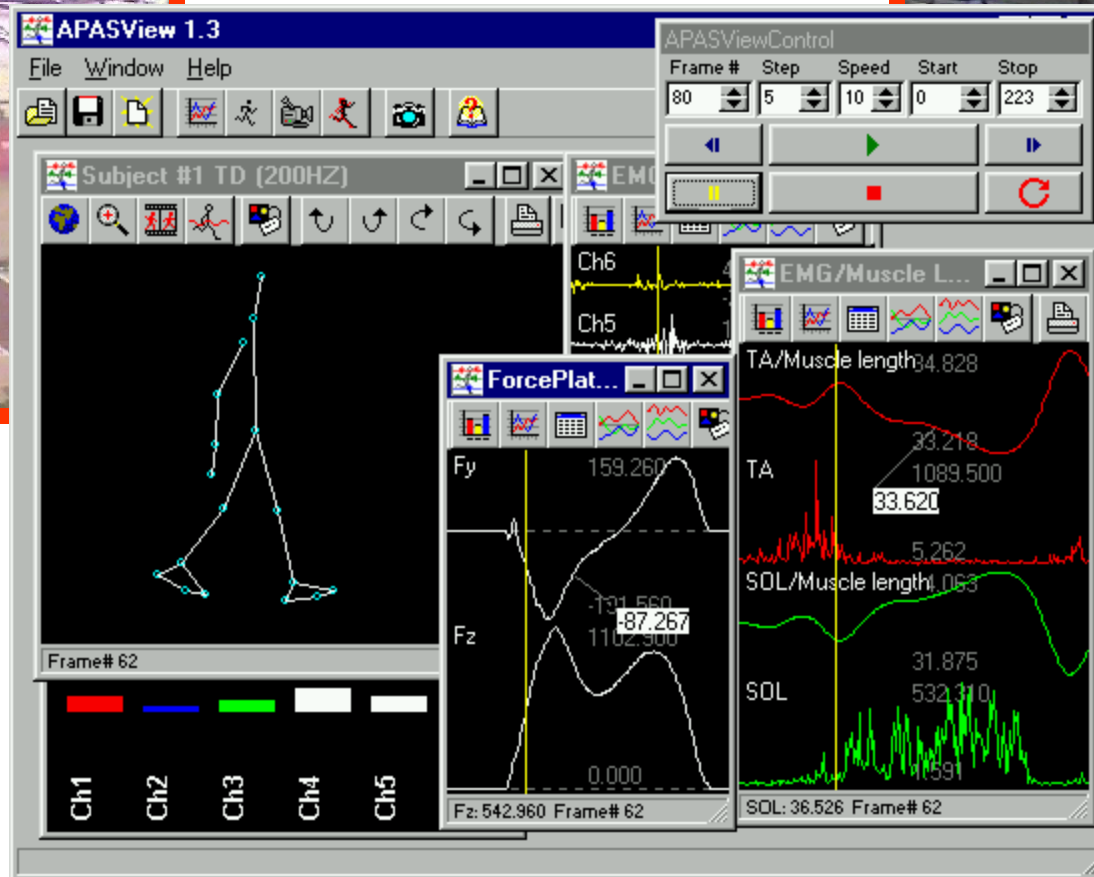
**Manual**

**Automatic**

**Transformation of the Data**

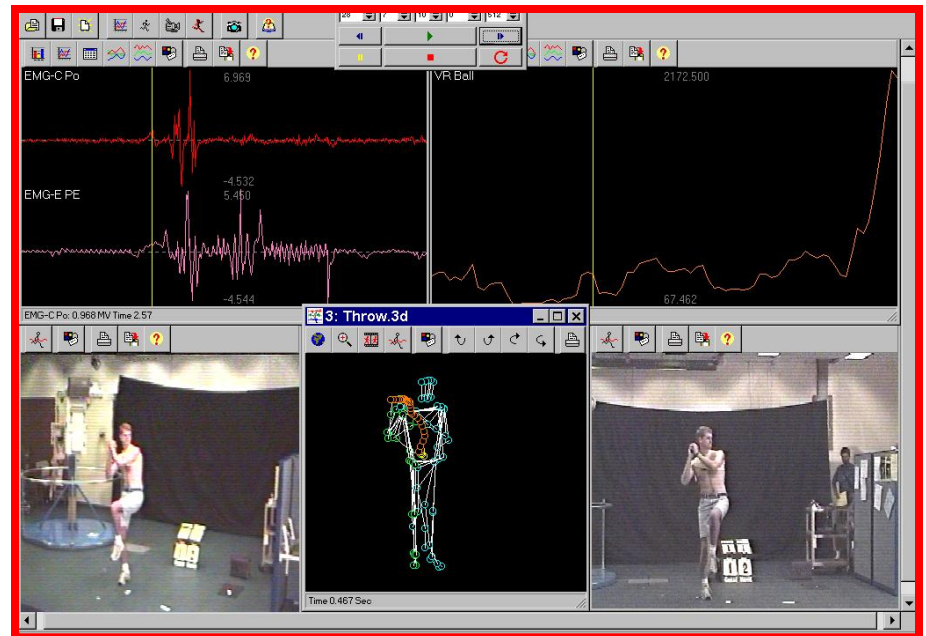
**2D - Two Dimensional**

**3D - Three Dimensional**



# Hardware

- Main Computer System
- Workstations
- Capture Card
- Network
  - Intranet
  - Internet
    - Renderer
    - Presentations





# Hi Speed Camera at 240 Hz

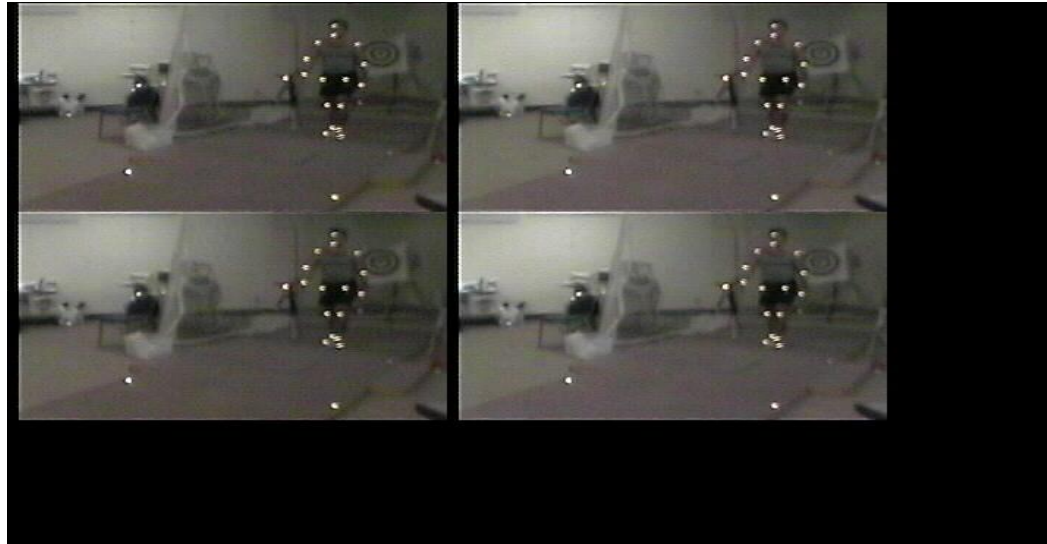
GR-DVL9500U

LCD Monitor VHS Camcorder





# Video Capturing Software Packages



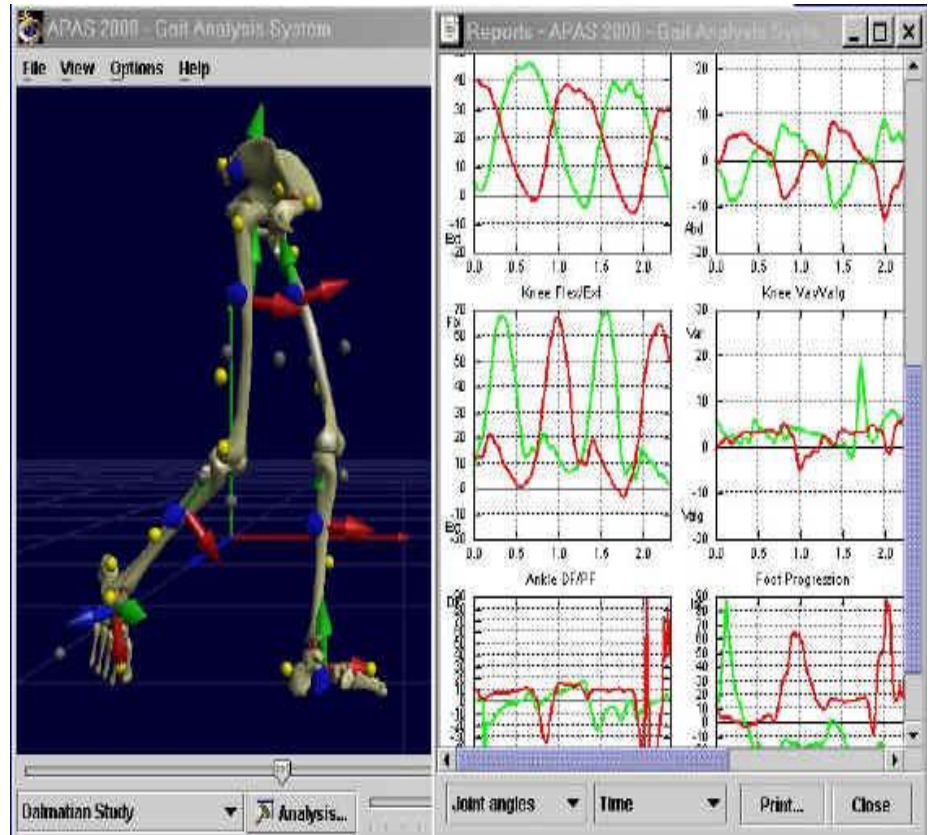
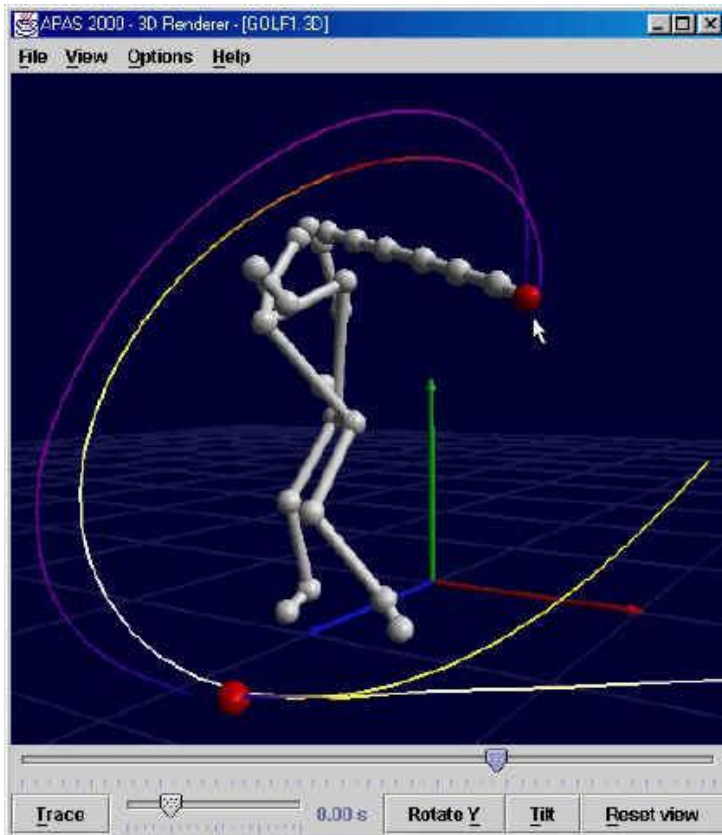
Microsoft HTML  
Document 5.0



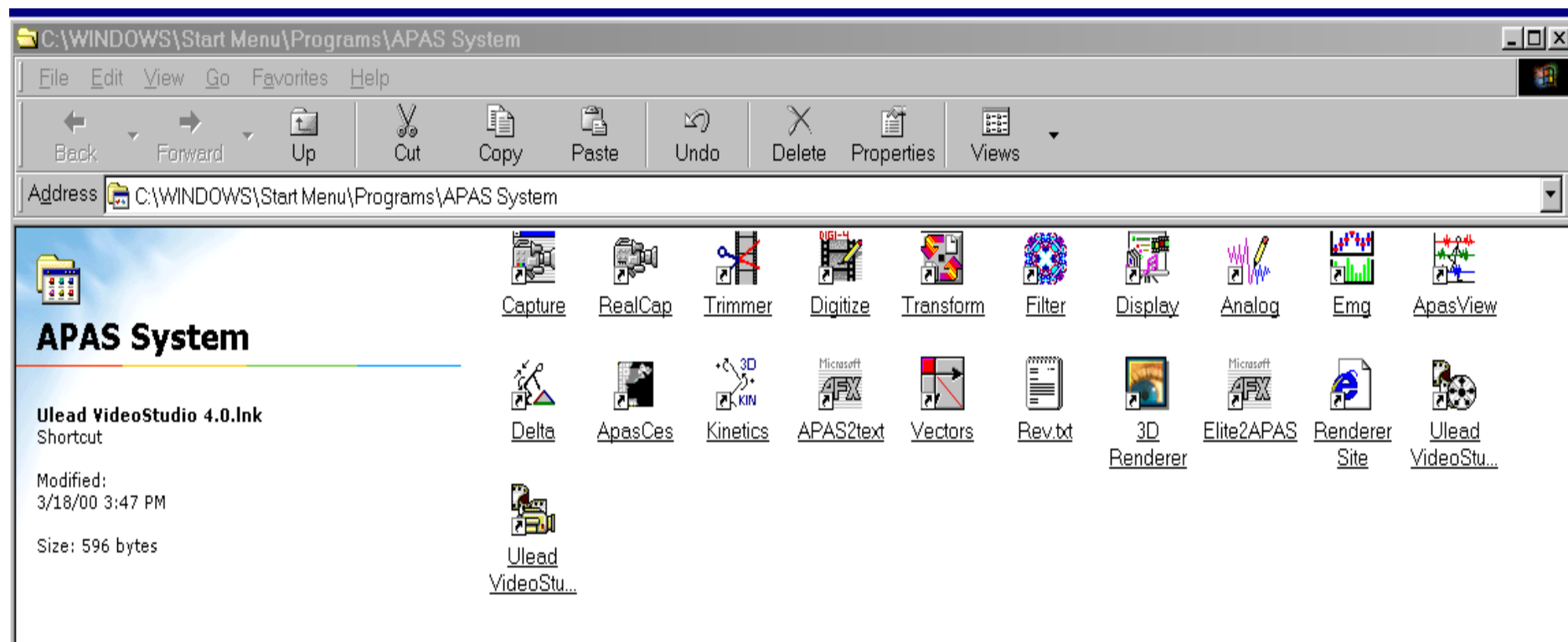
# Video Capturing System



# Software Integration



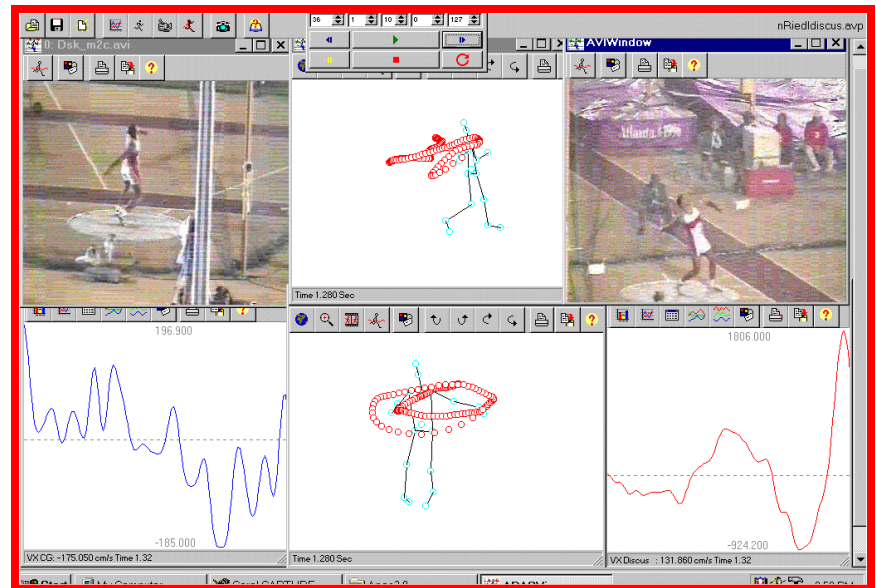
# Software Modules





# Software Integration

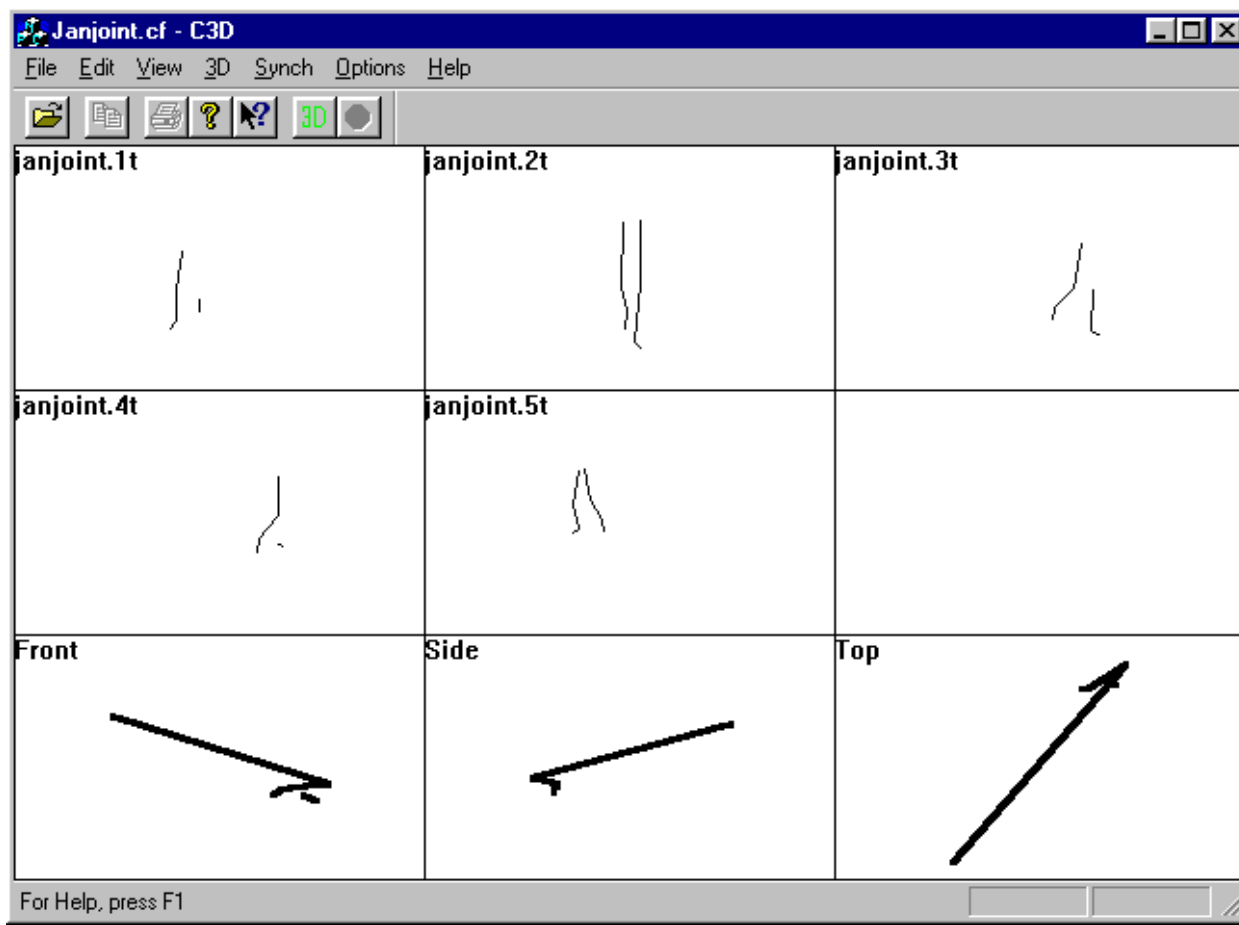
- Capturing
- Digitizing
  - Locally
  - Net Digitizing
- Transformation
- Filtering
- Kinematic Results Display
- Kinetic Results Display





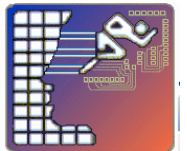
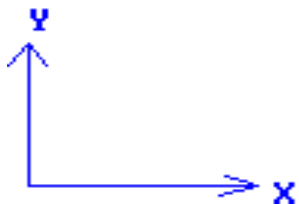
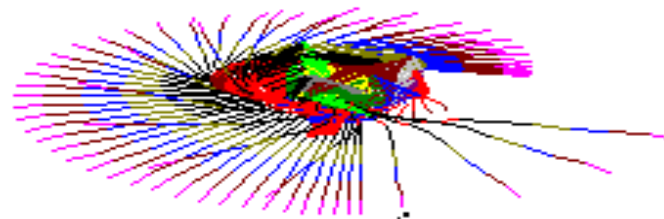
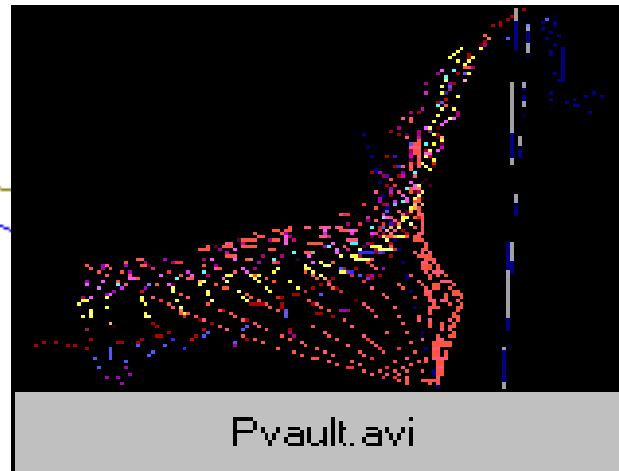
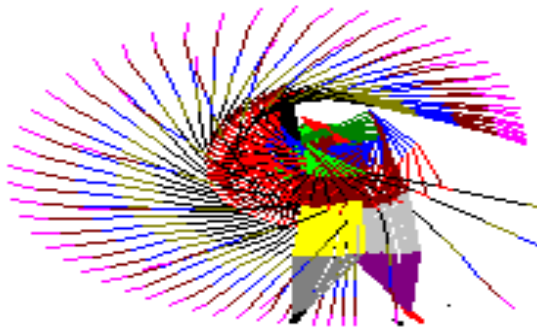
Application

# Transformation



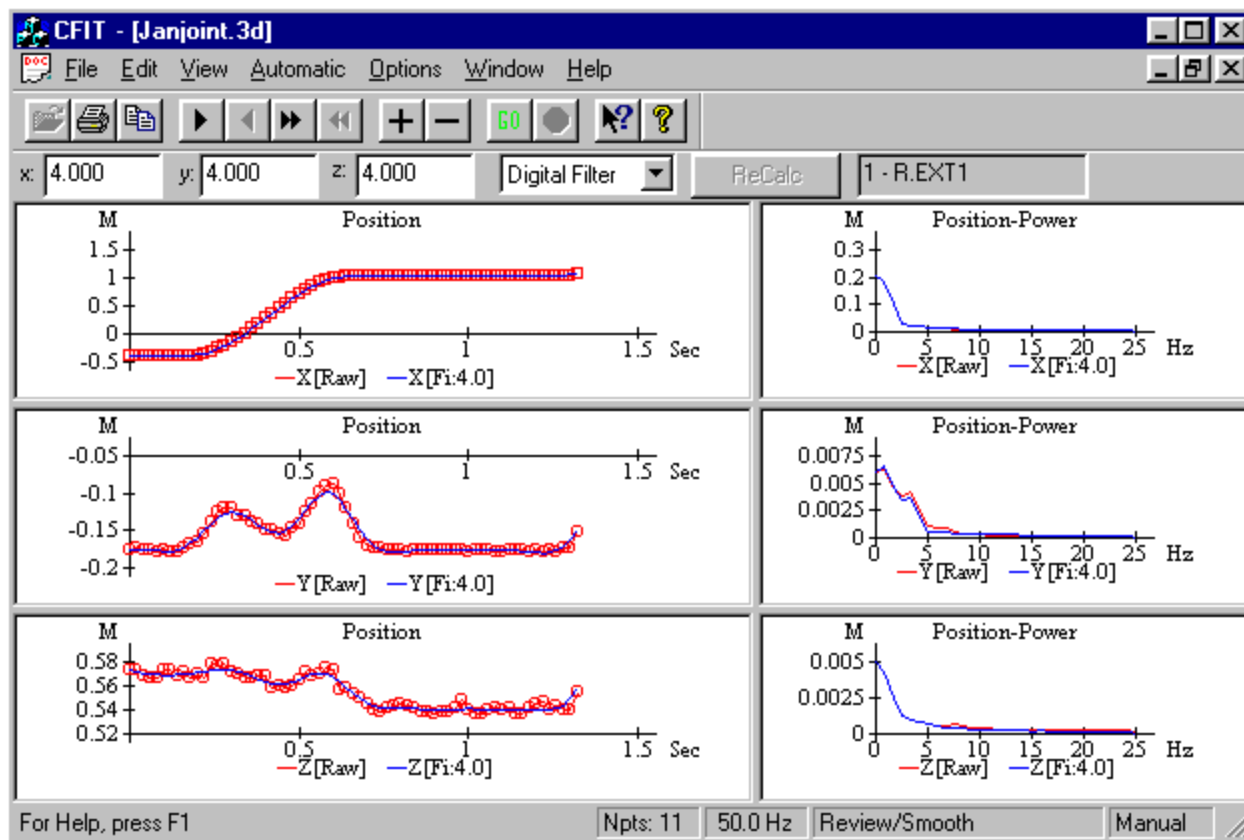
# Data Transformation

VIEWING Module C.B.A. Inc.

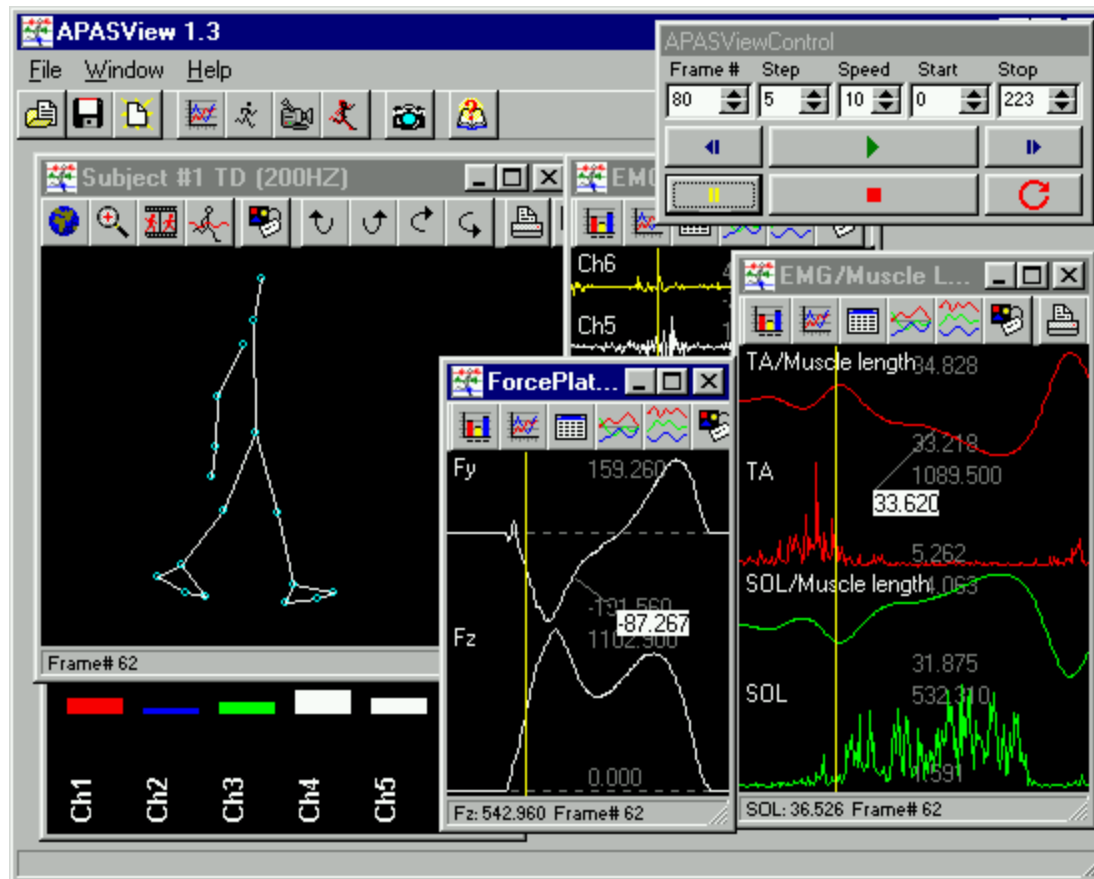




# Filtering/Smoothing



# Display and Analysis



## PROVIDE SIMULTANEOUS INTEGRATION OF:

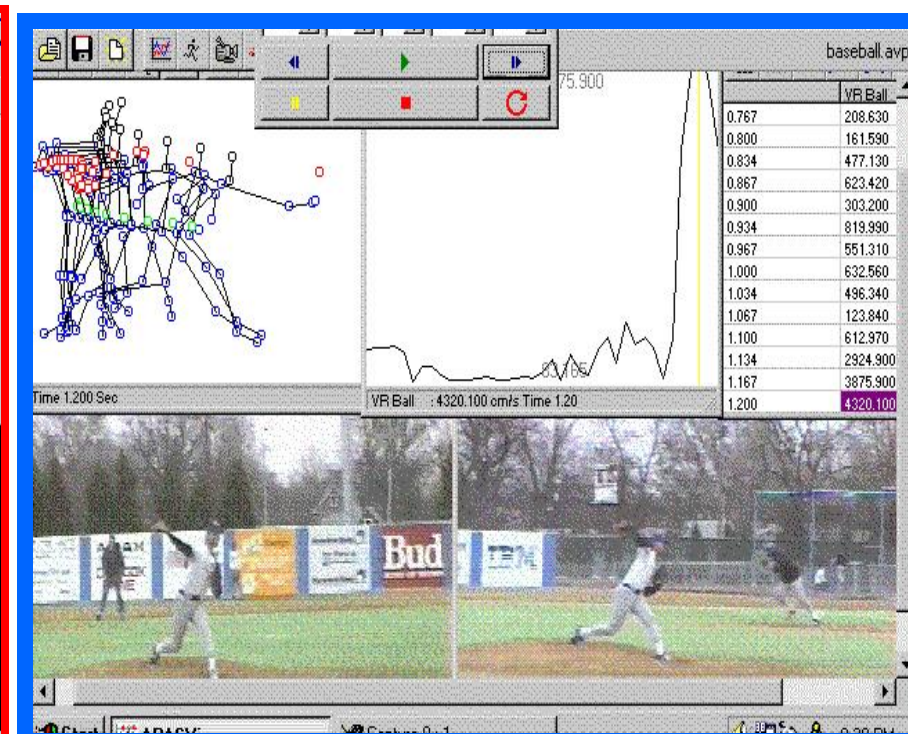
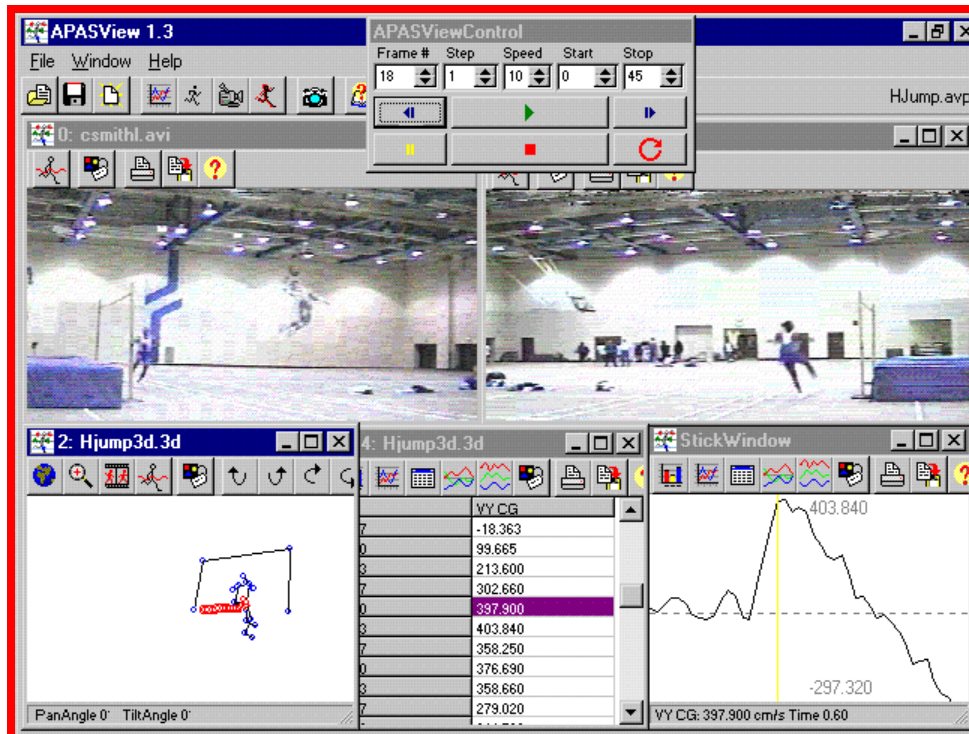
- Video Images,
- 3-D Stick Figures,
- Kinematic & Kinetic Data in graphic/tabular format,
- Analog information from force plate & EMG data



# Program Integration and Synchronization



apaview.exe



## **PROVIDE SIMULTANEOUS INTEGRATION OF:**

- **Video Images,**
- **3-D Stick Figures,**
- **Kinematic & Kinetic Data in graphic/tabular format,**
- **Analog information from force plate & EMG data**

## **Applications**

- **COACHING**
- **SPORT PERFORMANCE ANALYSIS**
- **OPTIMIZATION OF PERFORMANCE**

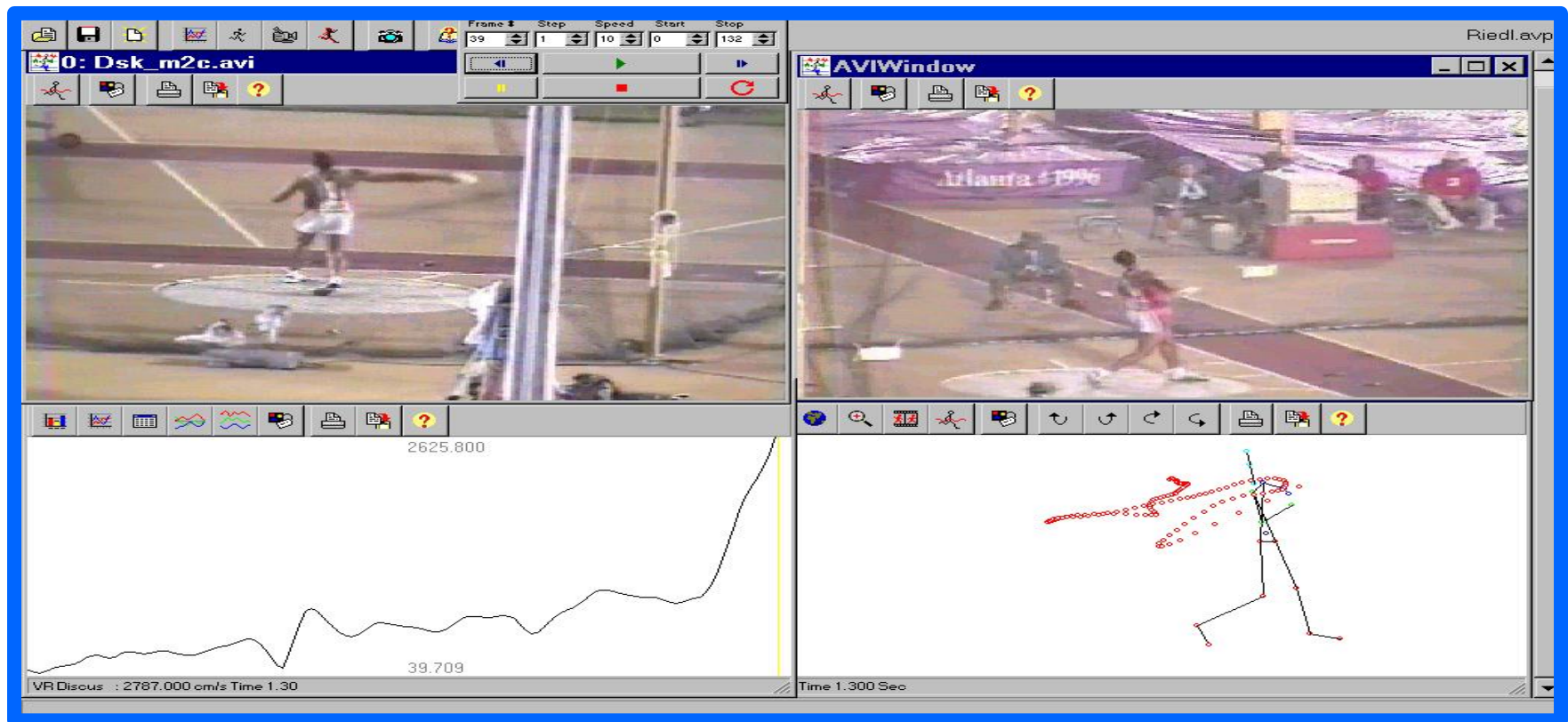


# TECHNIQUE COMPARISONS USING VIDEO DISPLAY



# Discus Throwing Analysis Using Video Viewing Option

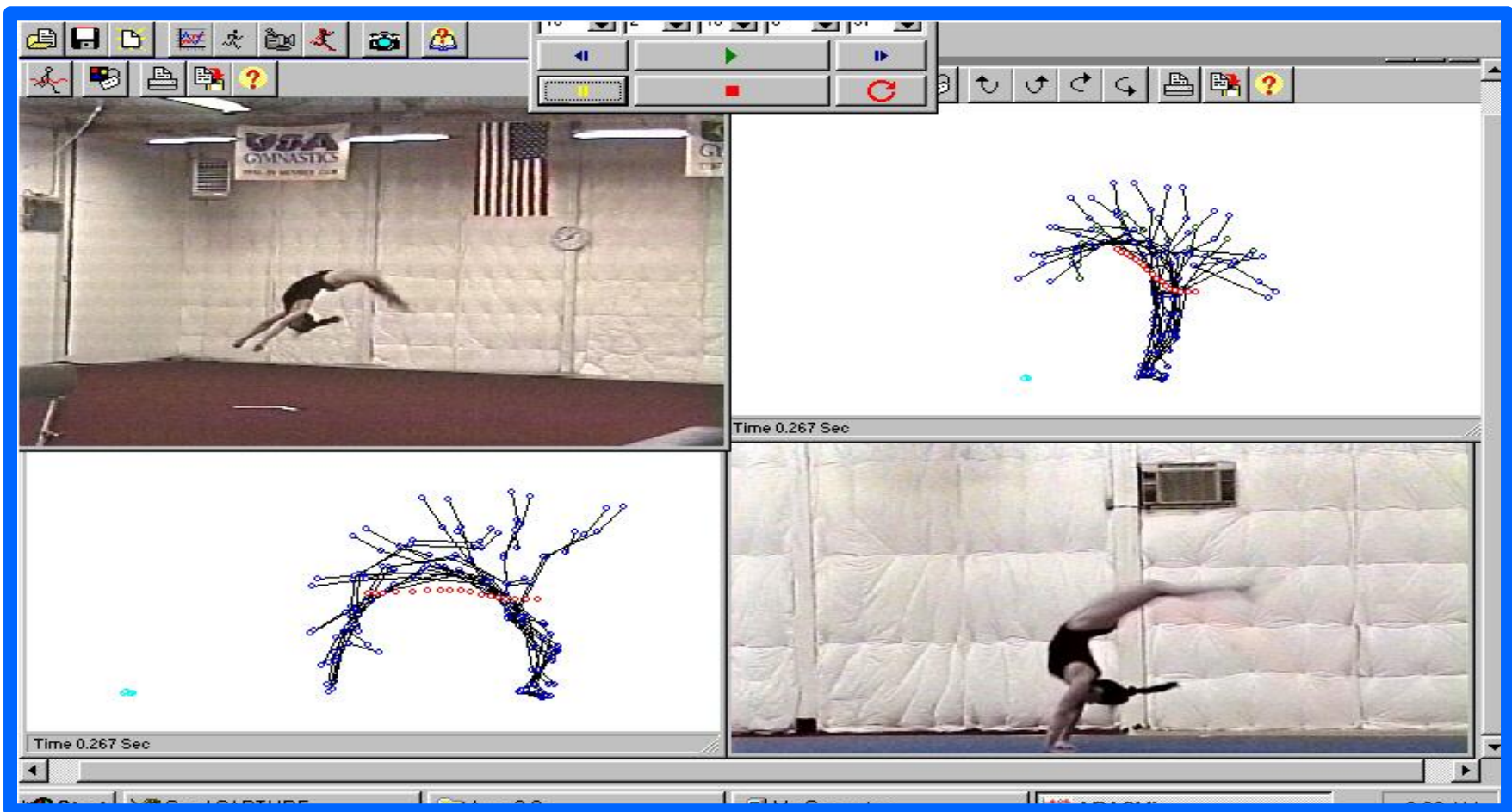
**Video View**--The video viewing function permits the biomechanist to observe a sport or functional movement from multiple perspectives, simultaneously. This allows the coach or clinical to perform sport or clinical evaluations at sampling rates that may be 2-10 times faster than visual observations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





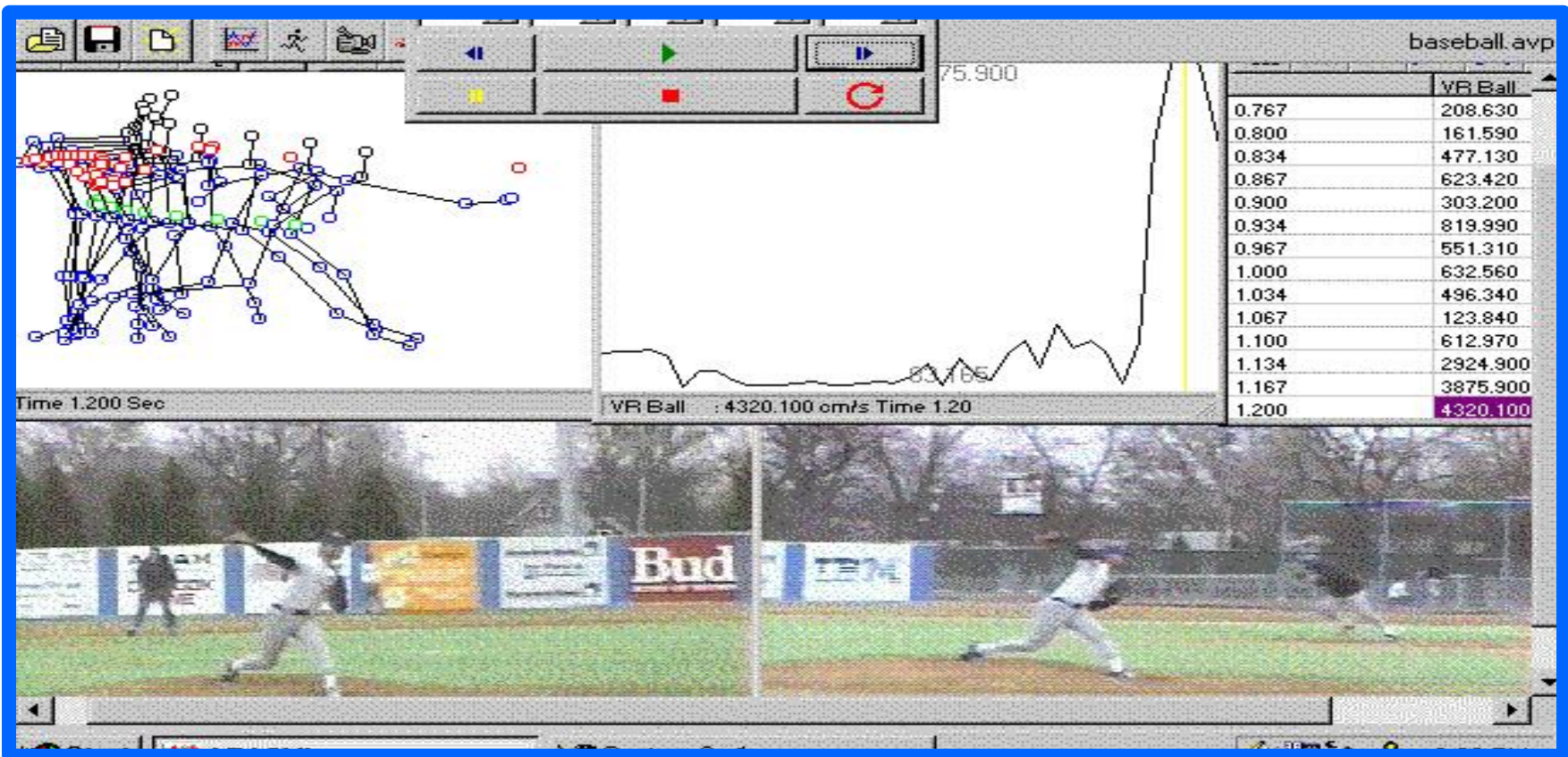
# *Gymnastics Techniques Comparison of Backhand Spring & Flic-Flac Using Synchronized Views*

**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.



# Baseball Pitching Analysis Using Integrated Viewing

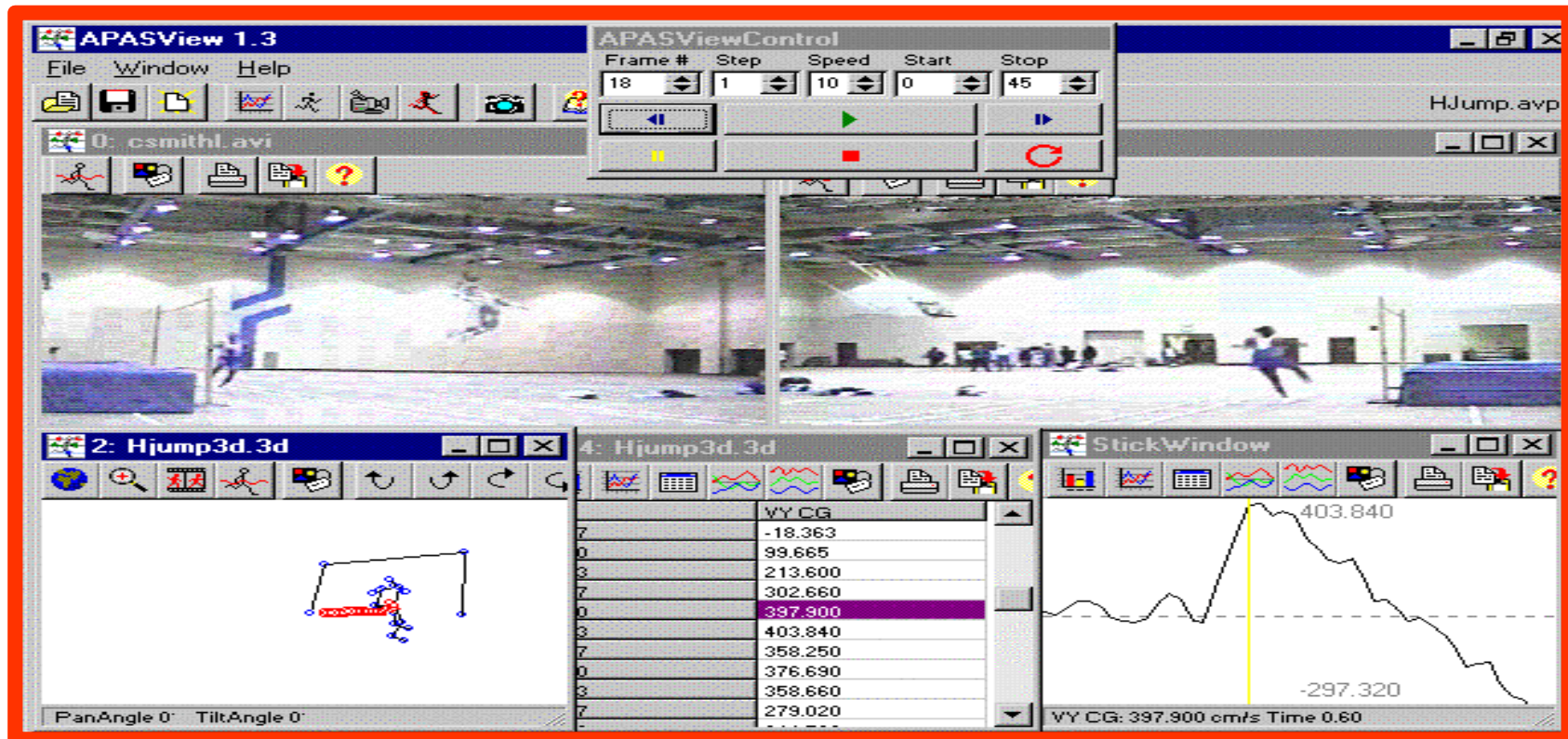
**Integrated View**--The viewing option permits the user to examine the kinematic / kinetic data of the human movement simultaneously with the data point trajectory and the corresponding video frame from multiple cameras). This feature of creating dynamic outputs may be used in performing simultaneously qualitative and quantitative analyses for sport performance.



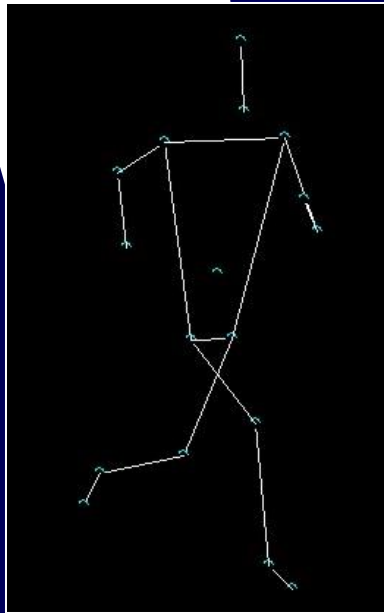


# High Jump Analysis Using Integrated Data Option

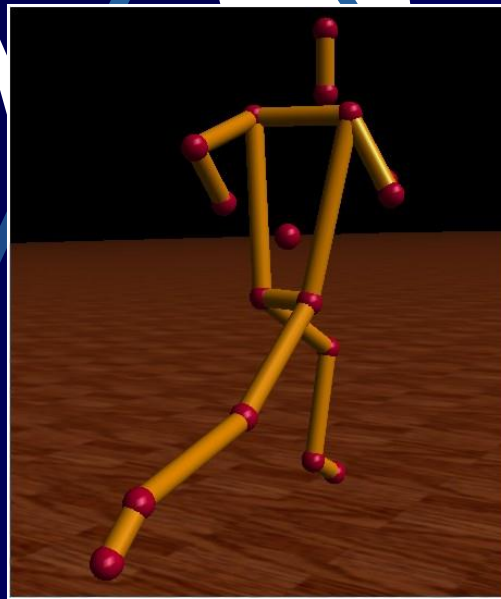
**Data View** -- The data view is capable of showing many different kinds of numerical data parameters, such as, displacement, velocity, force, EMG and so on. Each channel loaded can be manipulated numerically in order to normalize and modify the data. Each individual data channel can utilize a unique 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

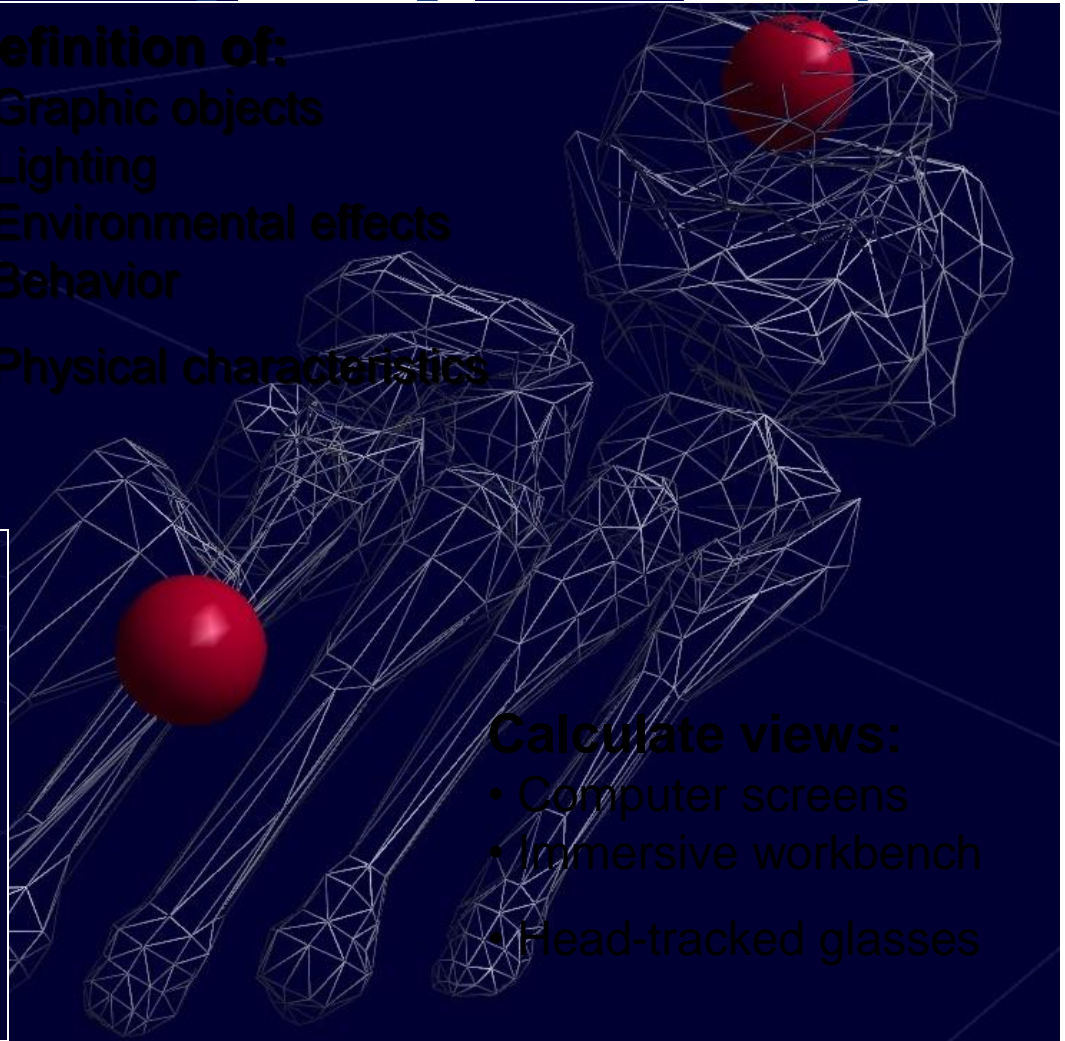
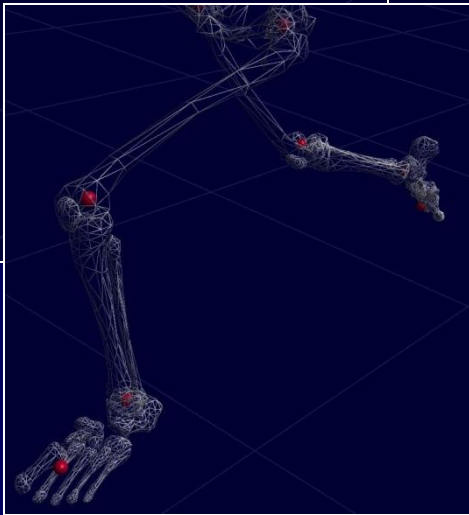
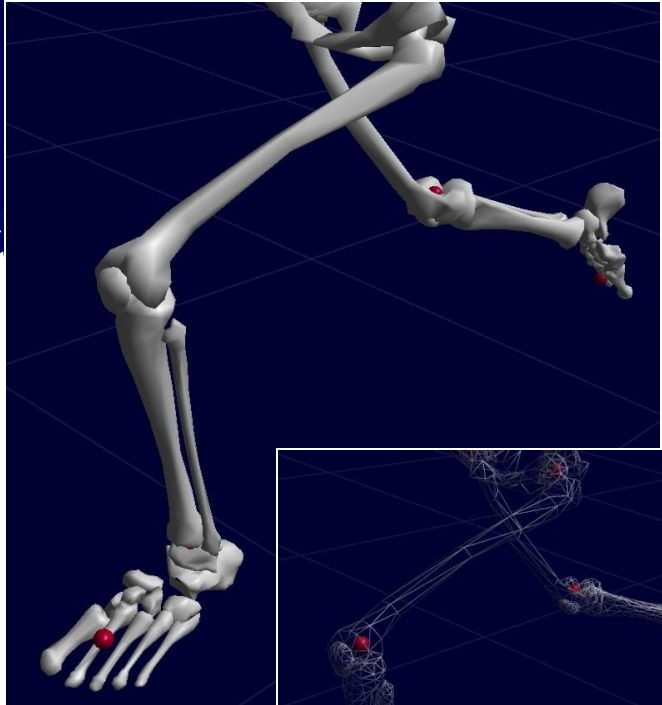


Real-time rendering

# What is Rendering anyway?

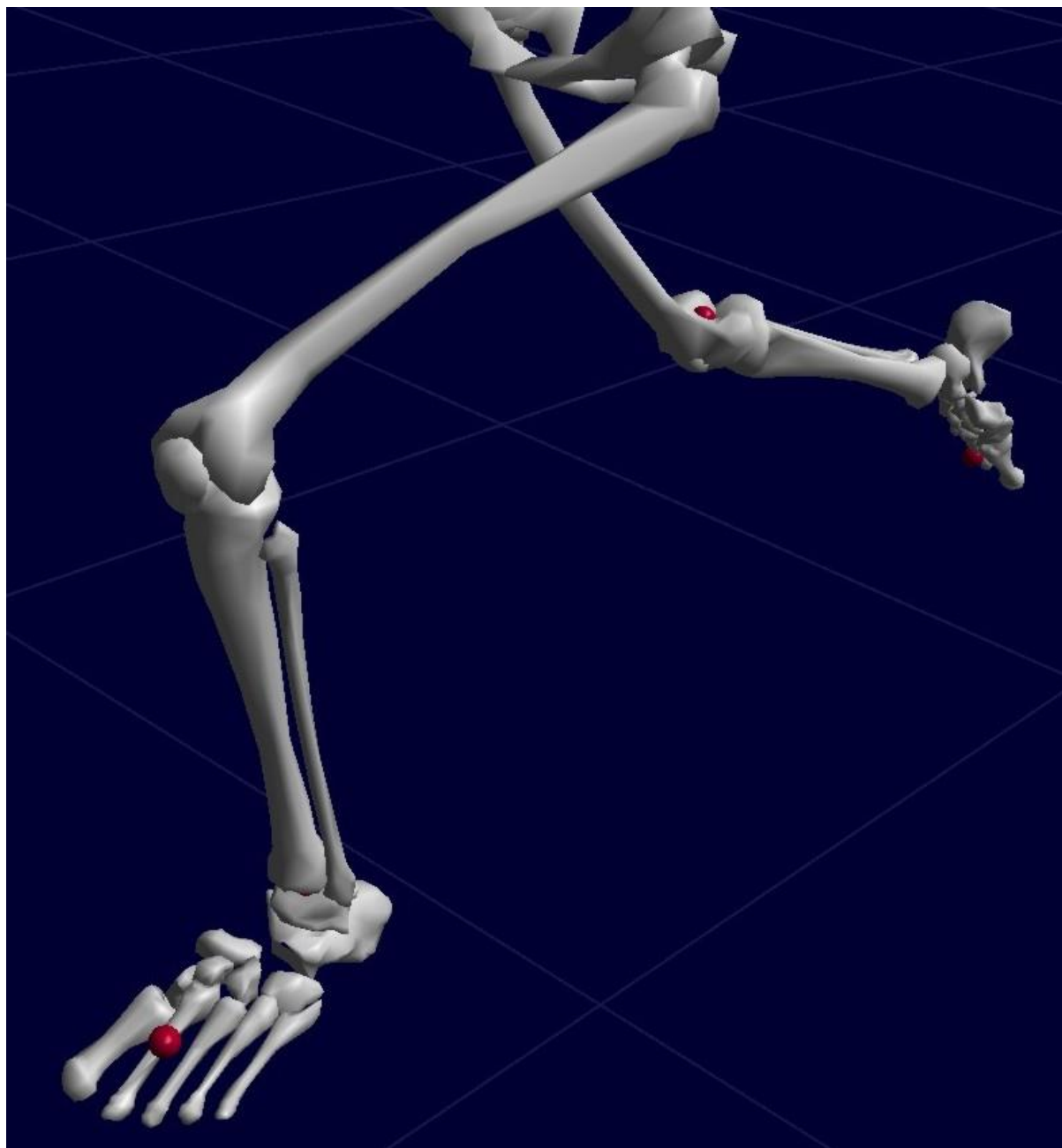
## Definition of:

- Graphic objects
- Lighting
- Environmental effects
- Behavior
- Physical characteristics

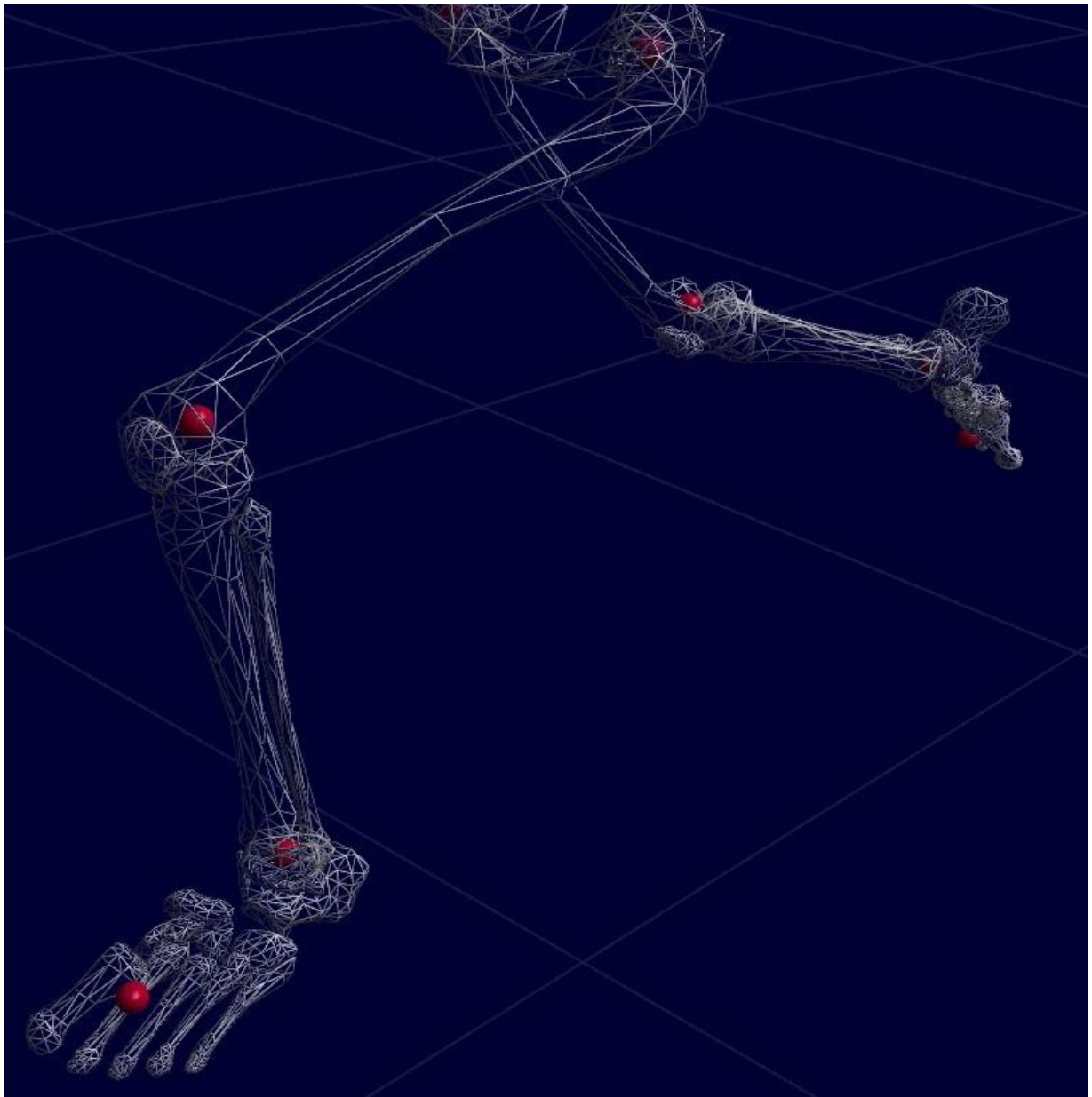


## Calculate views:

- 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

# THANK YOU

