

BIOLOGICAL FRAMEWORKS FOR ENGINEERS

Session #25 [m: Kinematics and Spinal Biomechanics]

General Objectives:

- ✓ There are various tools for taking kinematic measurements, each with their own set of advantages and disadvantages
- ✓ Kinematic models (2D or 3D) aim to describe the displacements and rotations of body segments in anatomically- and clinically-relevant terms
- ✓ Introduce spinal anatomy and discuss mechanical testing of the spine

Central Framework:

- ✓ Kinematics is the study of motion. Spinal biomechanics provides an example of how engineering principles can be used in the study of body segments and joints.

Interactive Activity:

- ✓ Video

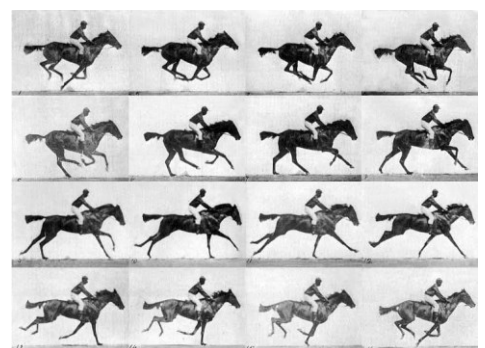
Session Outline:

I. Kinematics

Definition –

Reasons to study –

Historical background –



II. Kinematic measurement tools

Electrogoniometers



Electromagnetic systems

Marker-based optical motion capture systems



Markerless motion capture systems



III. Anatomical planes and terms of motion

Sagittal plane –

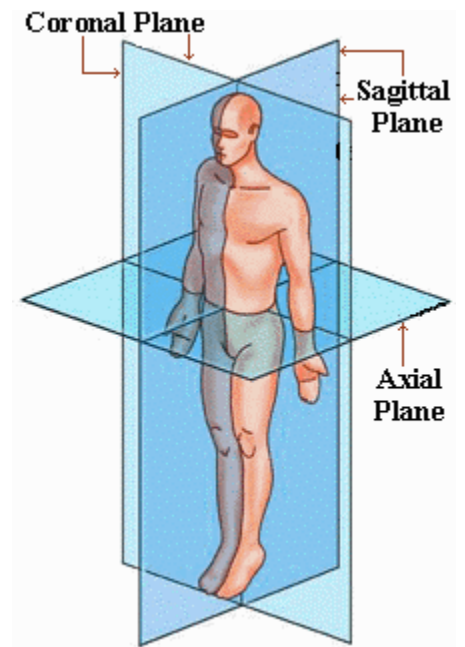
Frontal (coronal) plane –

Transverse plane –

Flexion and extension –

Abduction and adduction –

Axial rotation –

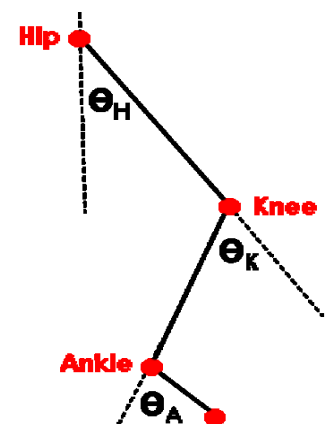


IV. Kinematic models

2D models

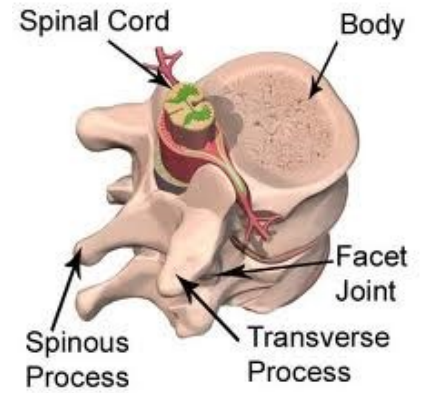
Anthropometric data

3D models



V. Spinal biomechanics

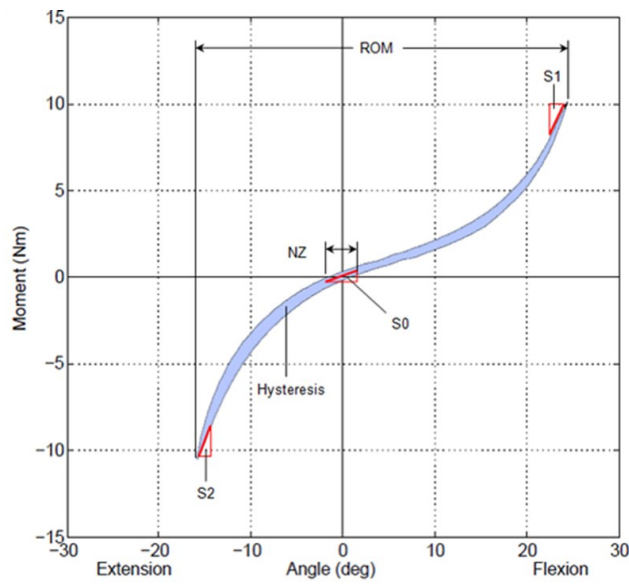
Spinal anatomy



Reasons to study spinal biomechanics

Mechanical testing

Output of bending tests



Moment-Angle Plot