INTRODUCTION TO SELECTED RESEARCH TOPICS IN MECHANICAL ENGINEERING – II

GAIT ANALYSIS

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Outline

- Phases of the Gait Cycle
- Motion Capture Systems
- Musculoskeletal Computer Models of Gait

Gait is the pattern of movement of the limbs of animals and humans.

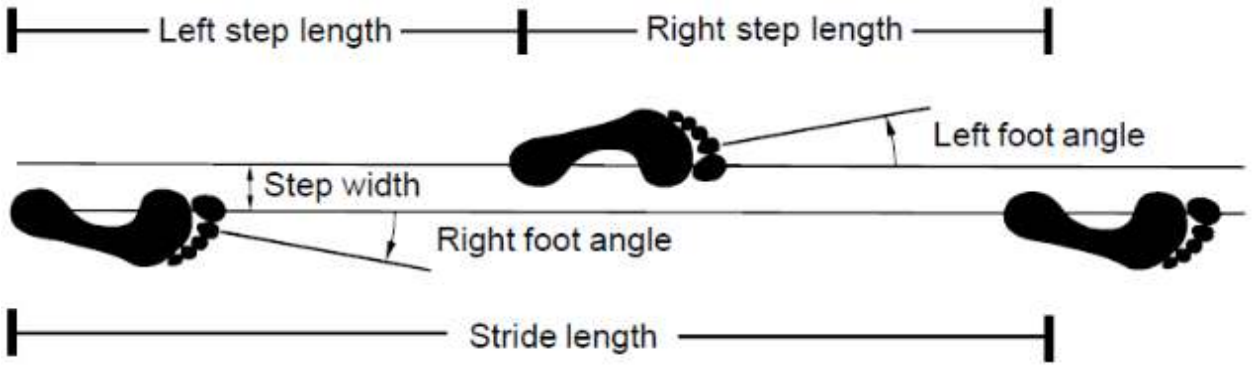
Gait analysis is a method used to assess the way we walk or run to highlight biomechanical abnormalities.

Why Is Gait Analysis so Important ?

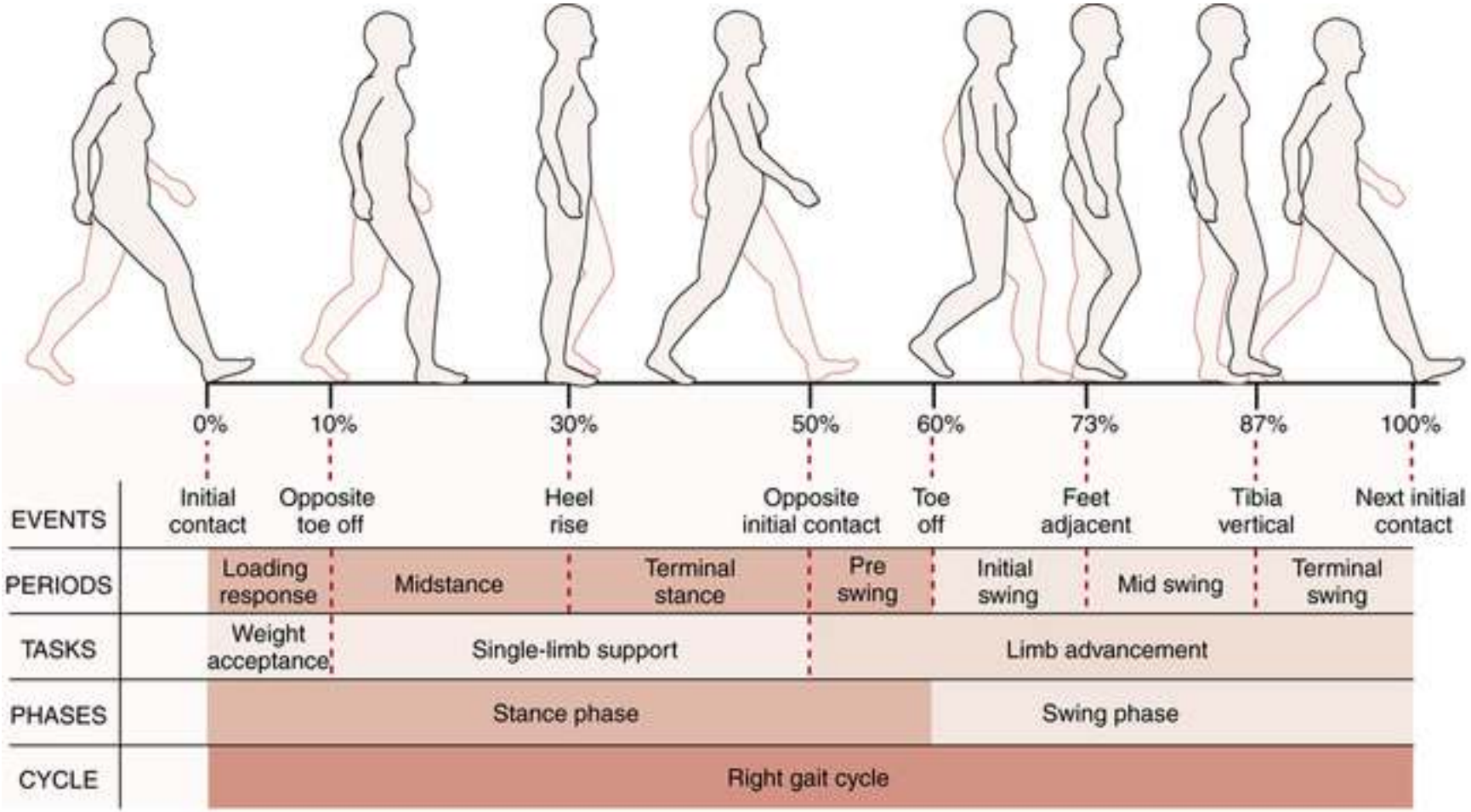
- Loss of the ability to walk can result significant health problems

- To correct and restore normal gait, allow those who have suffered an injury affecting their ability to walk or run to be diagnosed more efficiently and accurately.

A **gait cycle** is the time period or sequence of events or movements during walking in which one foot contacts the ground to when that same foot again contacts the ground. A single gait cycle is also known as a **stride.**



The Gait Cycle



What is Motion Capture Technology and What is it Used For?

- Motion capture is the process of recording the movement of objects or people. It is used in military, entertainment, sports, and medical applications, and for validation of computer vision and robotics.

- Motion capture has two basic applications
  - *Recording*
  - *Real-time*

- Three basic methods for traditional motion capture
  - *Magnetic*
  - *Optical*
  - *Mechanical*

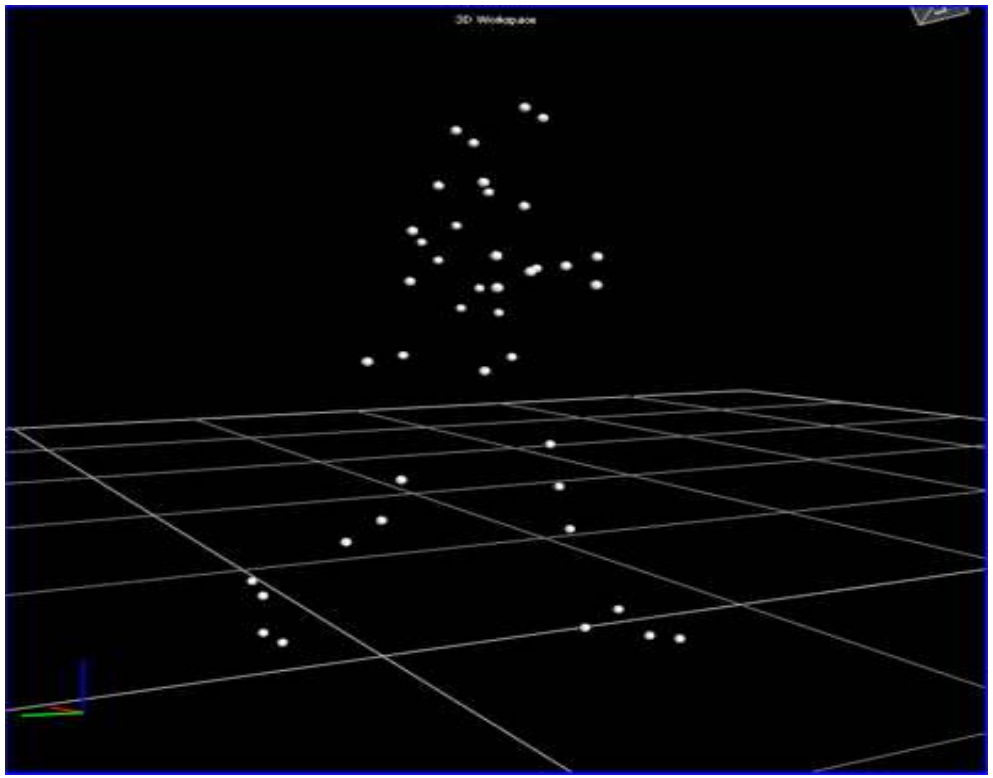
Basic Steps For Post Processing

1. Checking to make sure markers are in correct position

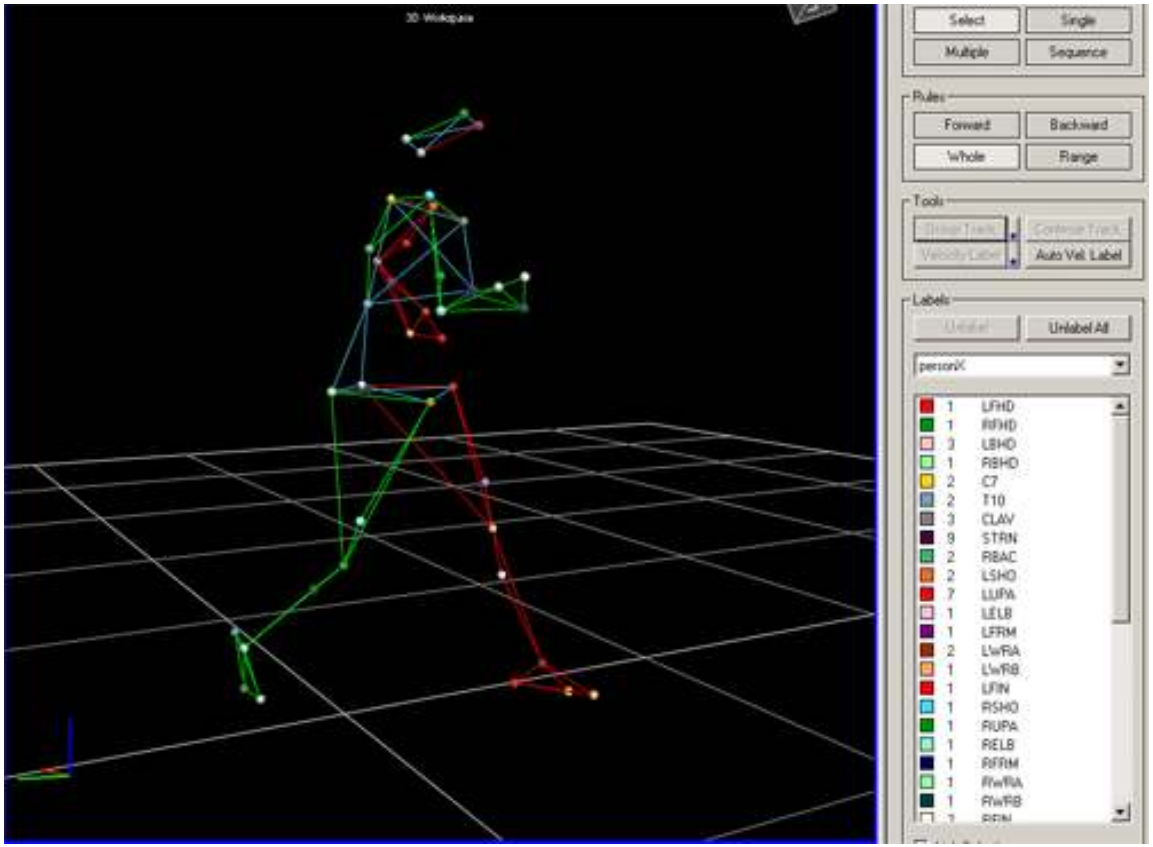
2. Marker Labeling

3. Checking for marker swaps and gaps

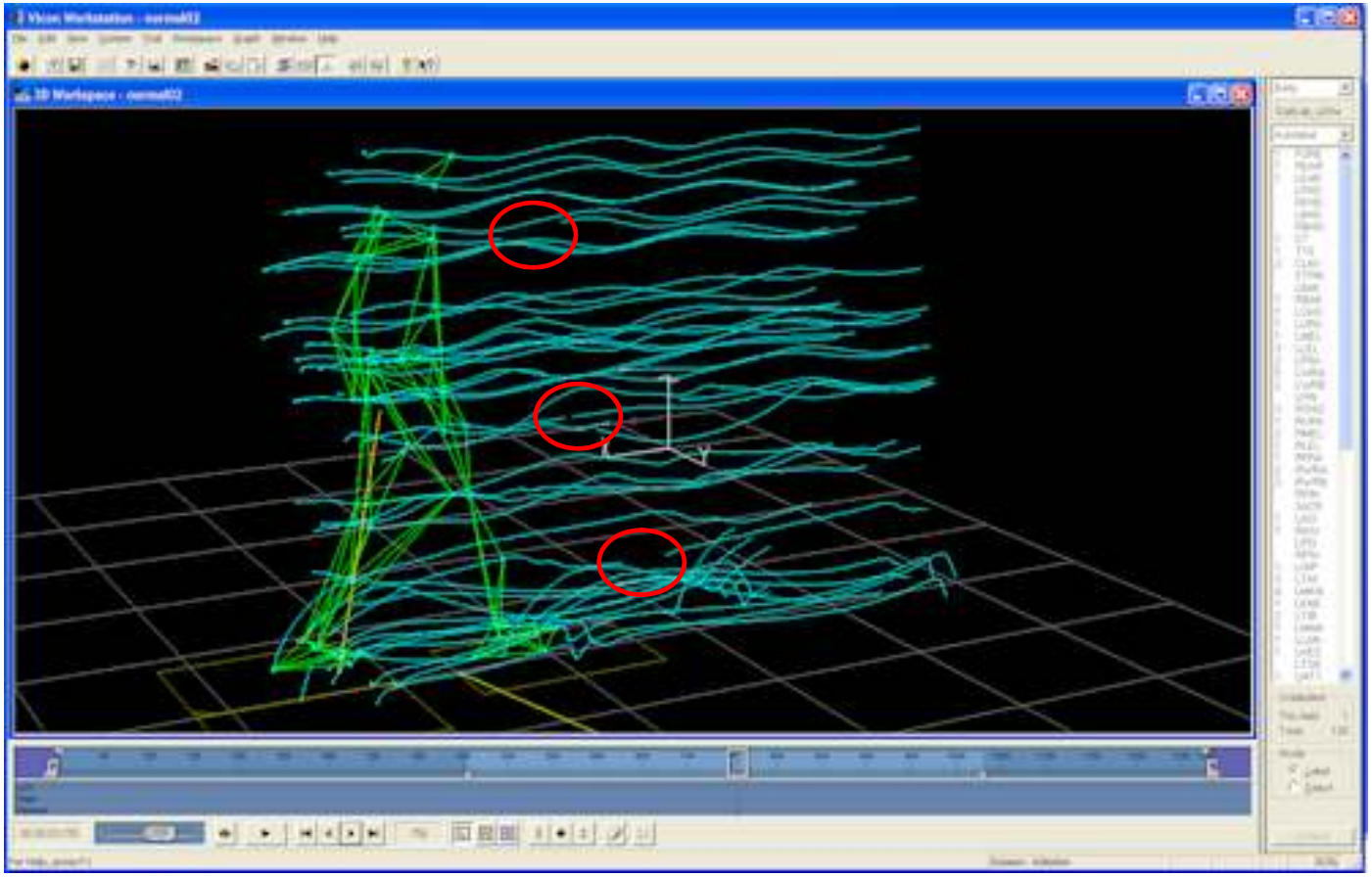
Initial Marker Position



Marker Labelling



Gap Filling



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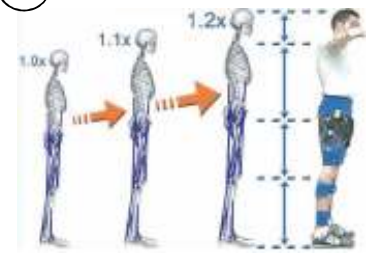
Collecting Data

1



Scaling

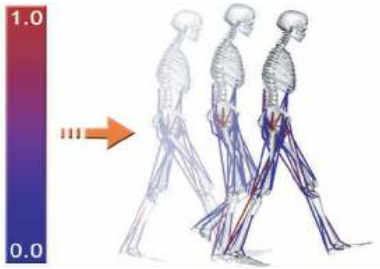
2

Inverse Kinematics

3

Inverse Dynamics

4



Static Optimization

Methods

Inverse kinematics	→	Joint angles
Inverse dynamics	→	Net joint torques
Static optimisation	→	Muscle forces

Computational Modelling