HAB718 Spor Biyomekaniğinde Hareket Analizi

Serdar Arıtan

Hacettepe Üniversitesi
Spor Bilimleri Fakültesi
Biyomekanik Araştırma Grubu

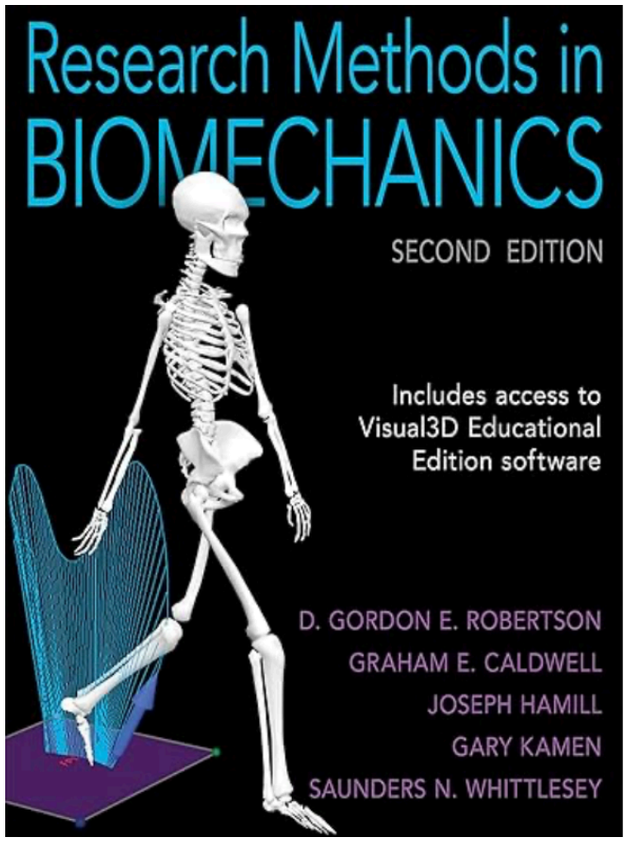
serdar.aritan@hacettepe.edu.tr

HAB718 Spor Biyomekaniğinde Hareket Analizi

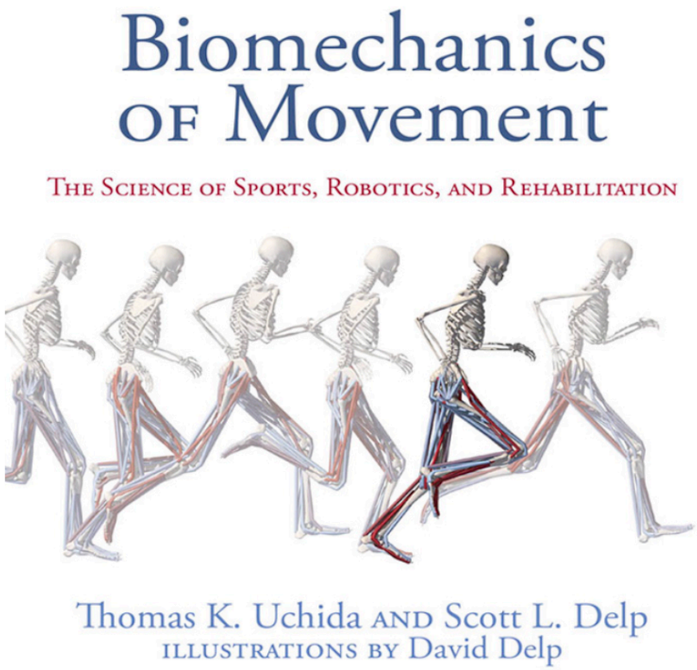
- Two-Dimensional Kinematics
- Three-Dimensional Kinematics
- Body Segment Parameters
- Three-Dimensional Kinetics
- Muscle Modelling
- Computer Simulation of Human Movement
- Musculoskeletal Modelling

HAB718 Spor Biyomekaniğinde Hareket Analizi

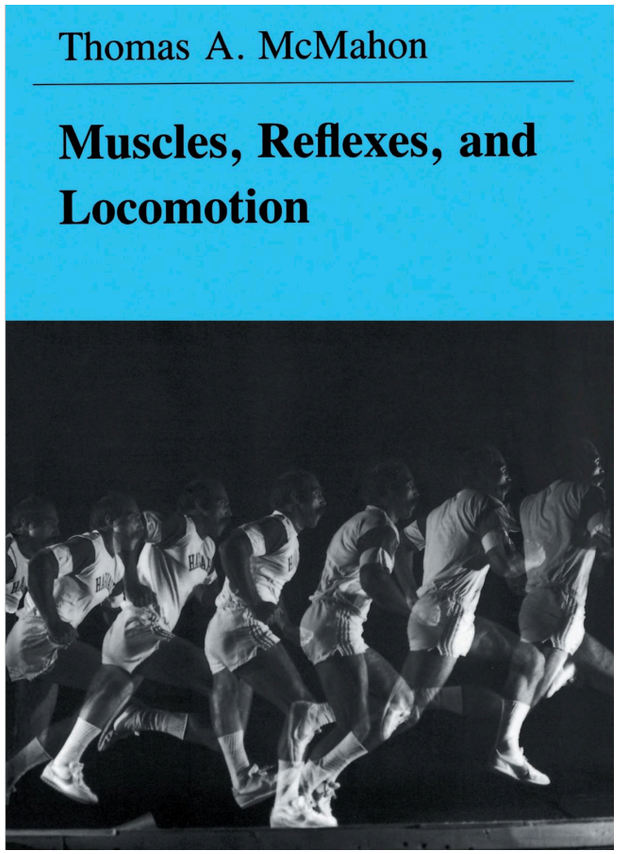
Textbooks recommended for the course



- **Publisher : Human Kinetics; Second edition (November 1, 2013)**
- **Language : English**
- **Hardcover : 440 pages**
- **ISBN-10 : 0736093400**
- **ISBN-13 : 978-0736093408**

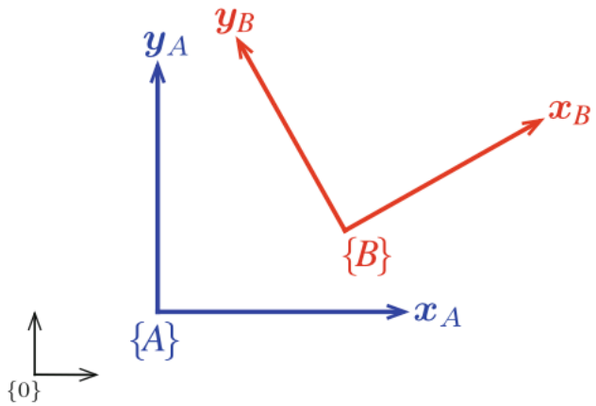


- **Publisher : The MIT Press; 1st edition (January 12, 2021)**
- **Language : English**
- **Hardcover : 400 pages**
- **ISBN-10 : 0253330580**
- **ISBN-13 : 978-0253330581**



- **Publisher : Princeton University Press (April 1, 1984)**
- **Language : English**
- **Paperback : 354 pages**
- **ISBN-10 : 069102376X**
- **ISBN-13 : 978-0691023762**

HAB718 Spor Biyomekaniğinde Hareket Analizi



1D – 1-dimensional

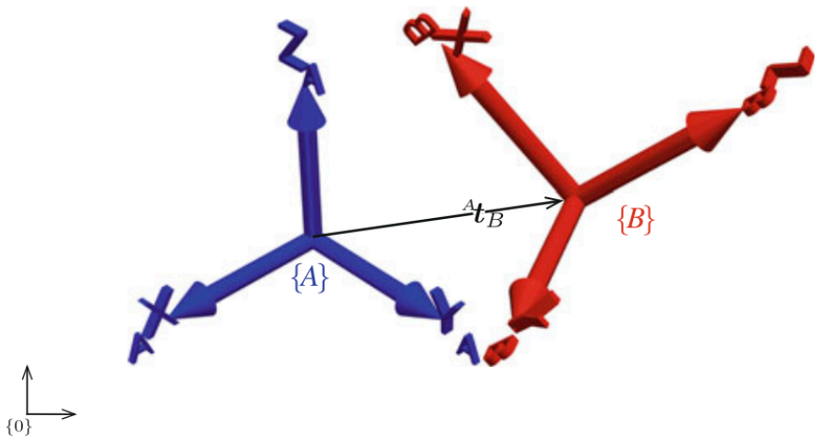
2D – 2-dimensional

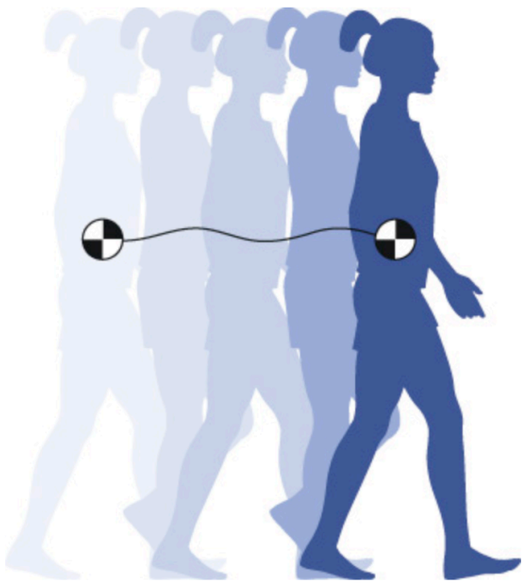
3D – 3-dimensional

CoM – Center of mass

DoF – Degrees of freedom

***n*-tuple** – A group of n numbers, it can represent a point or a vector





Euler (1707–1783) was a Swiss mathematician and physicist who dominated eighteenth century mathematics. He was a student of Johann Bernoulli and applied new mathematical techniques such as calculus to many problems in mechanics and optics.

Cardano (1501–1576) was an Italian Renaissance mathematician, physician, astrologer, and gambler.

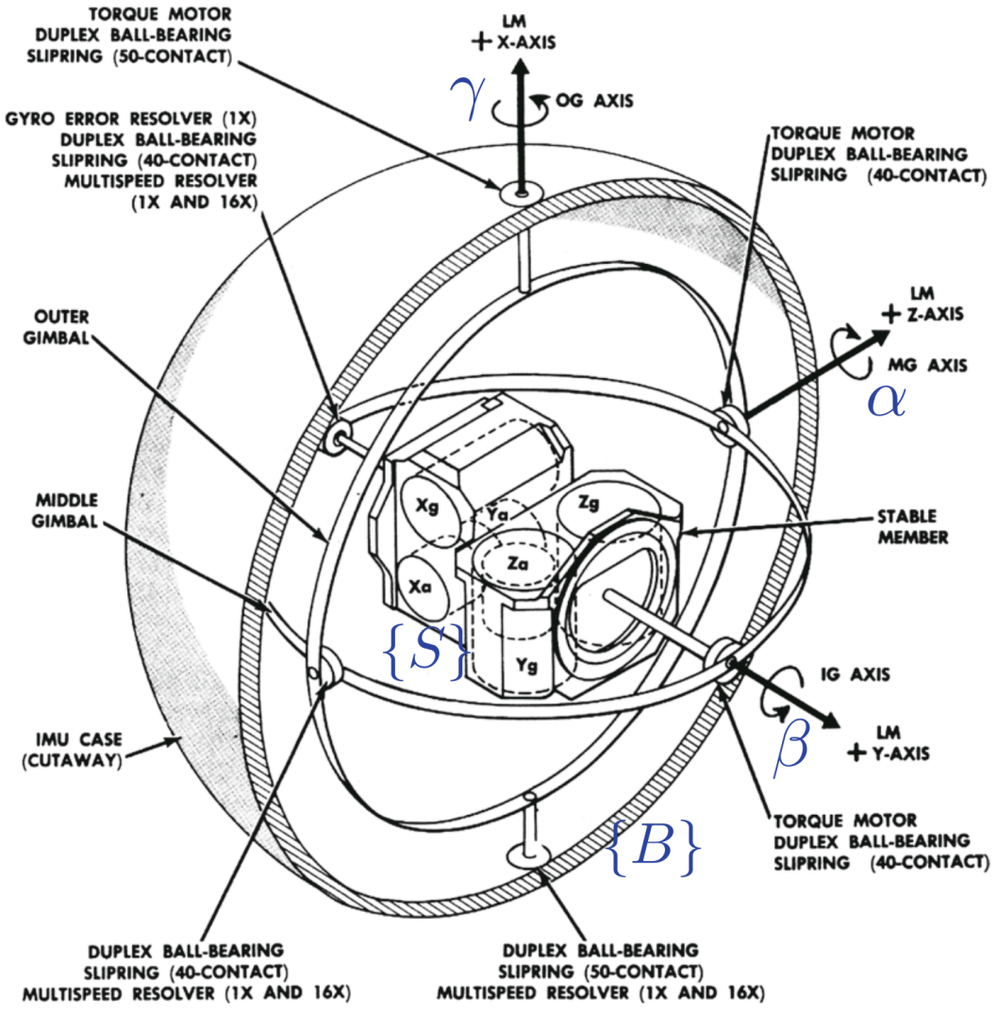
HAB718 Spor Biyomekaniğinde Hareket Analizi

Singularities and GimbalLock

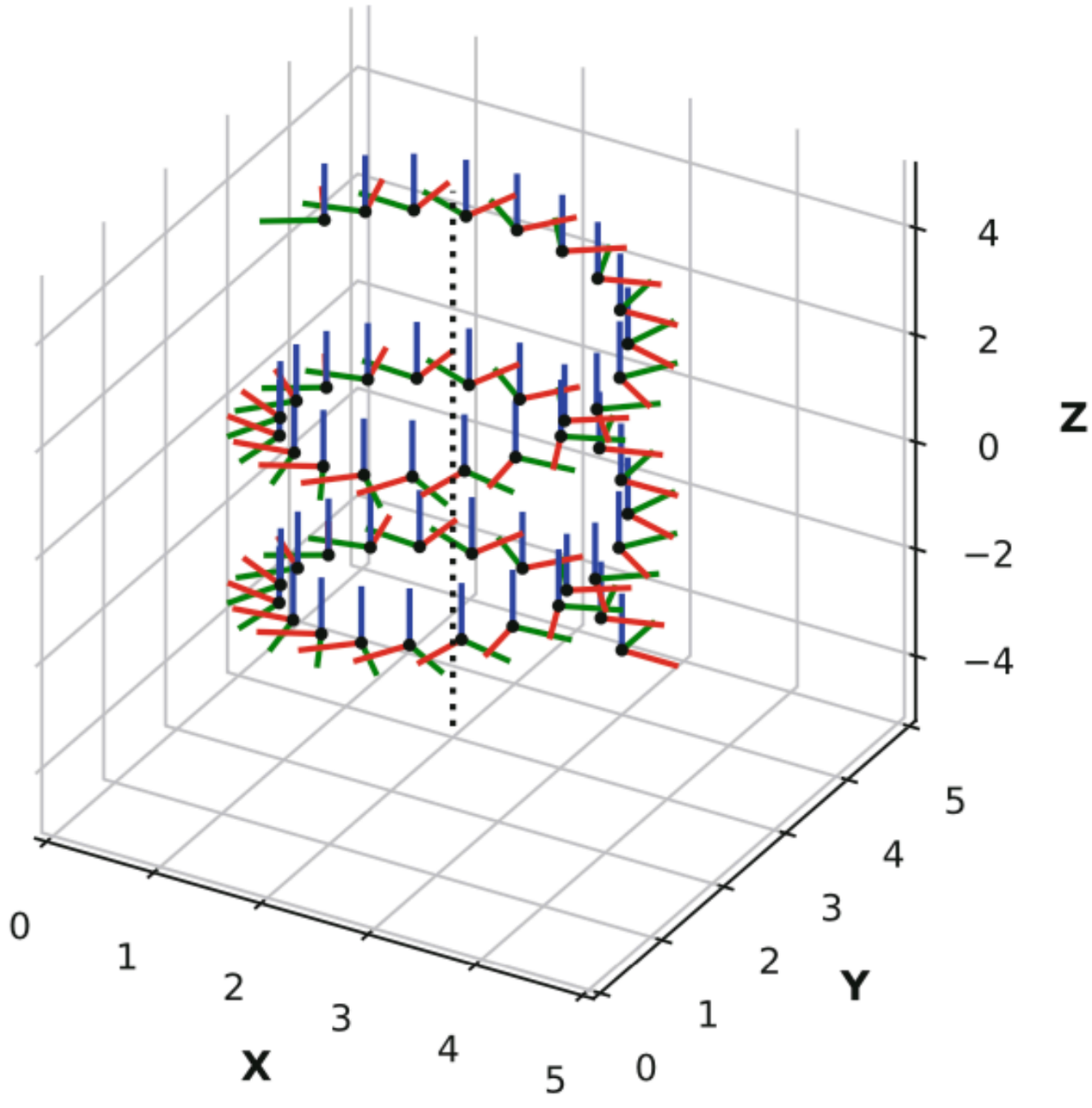
Apollo 13 mission clock: 02 08 12 47

- **Flight:** “Go, Guidance.”
- **Guido:** “He’s getting close to gimbal lock there.”
- **Flight:** “Roger. CapCom, recommend he bring up C3, C4, B3, B4, C1 and C2 thrusters, and advise he’s getting close to gimbal lock.”
- **CapCom:** “Roger.”

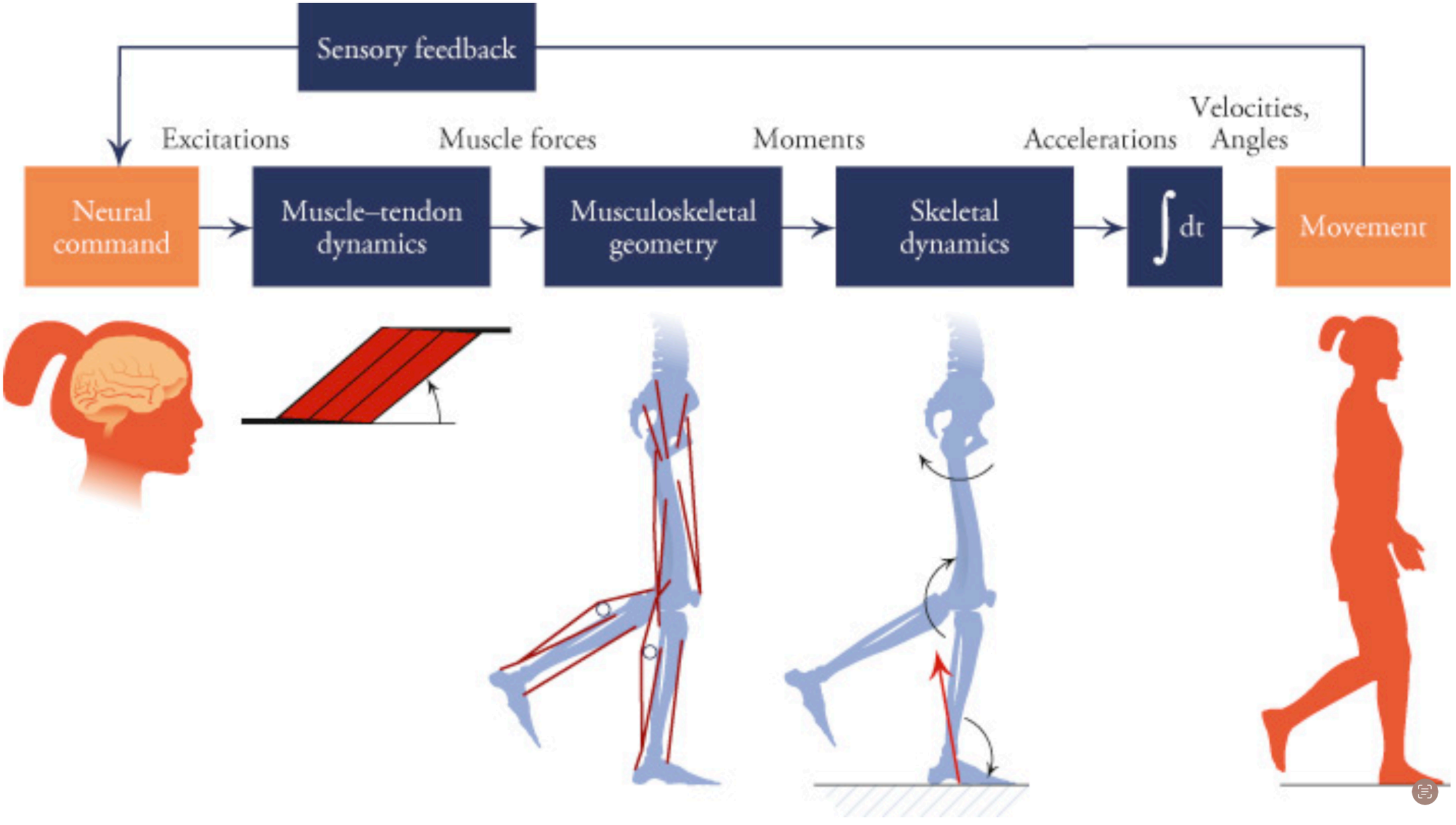
Apollo 13, mission control communications loop (1970) (Lovell and Kluger 1994, p 131; NASA 1970).



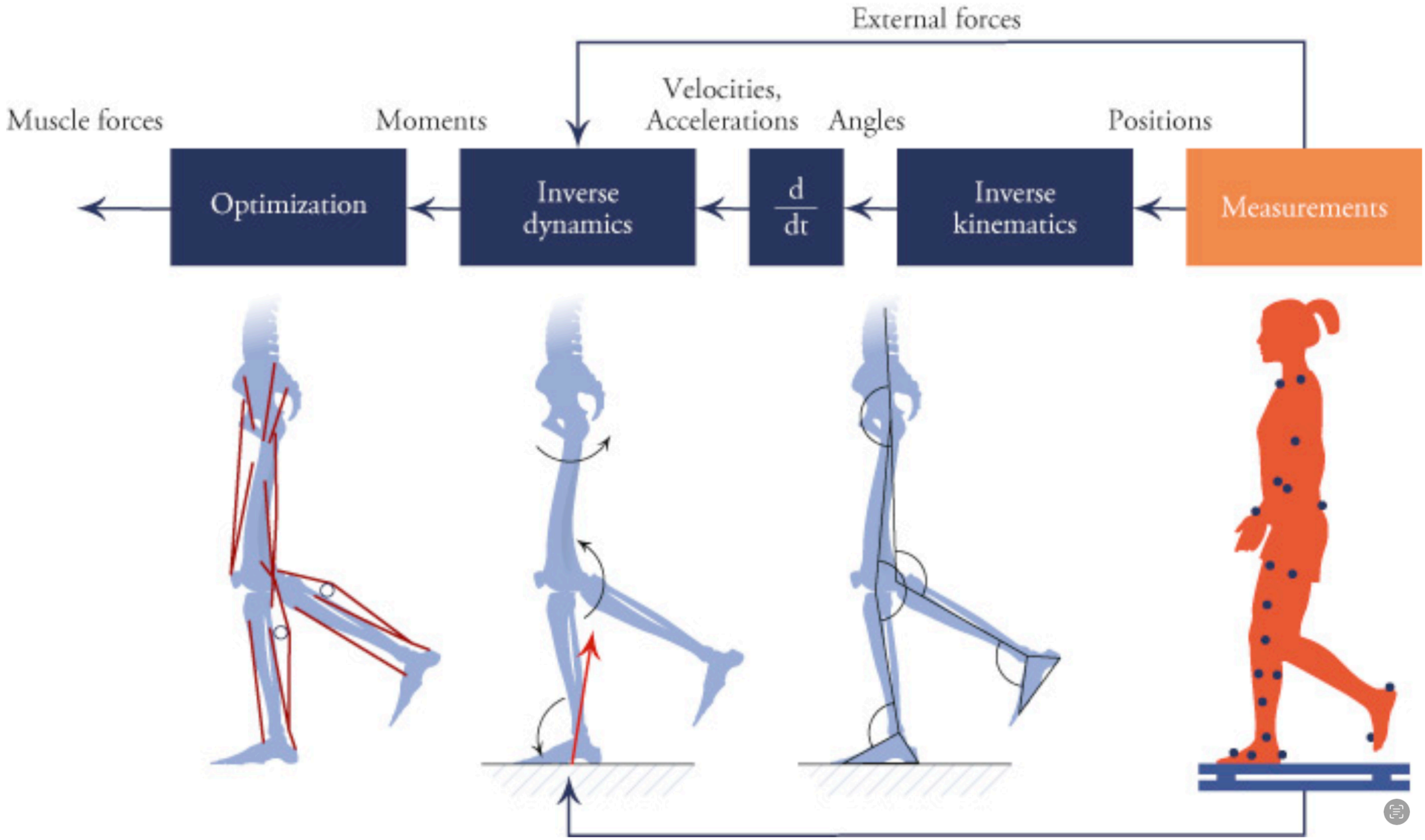
HAB718 Spor Biyomekaniğinde Hareket Analizi



HAB718 Spor Biyomekaniğinde Hareket Analizi

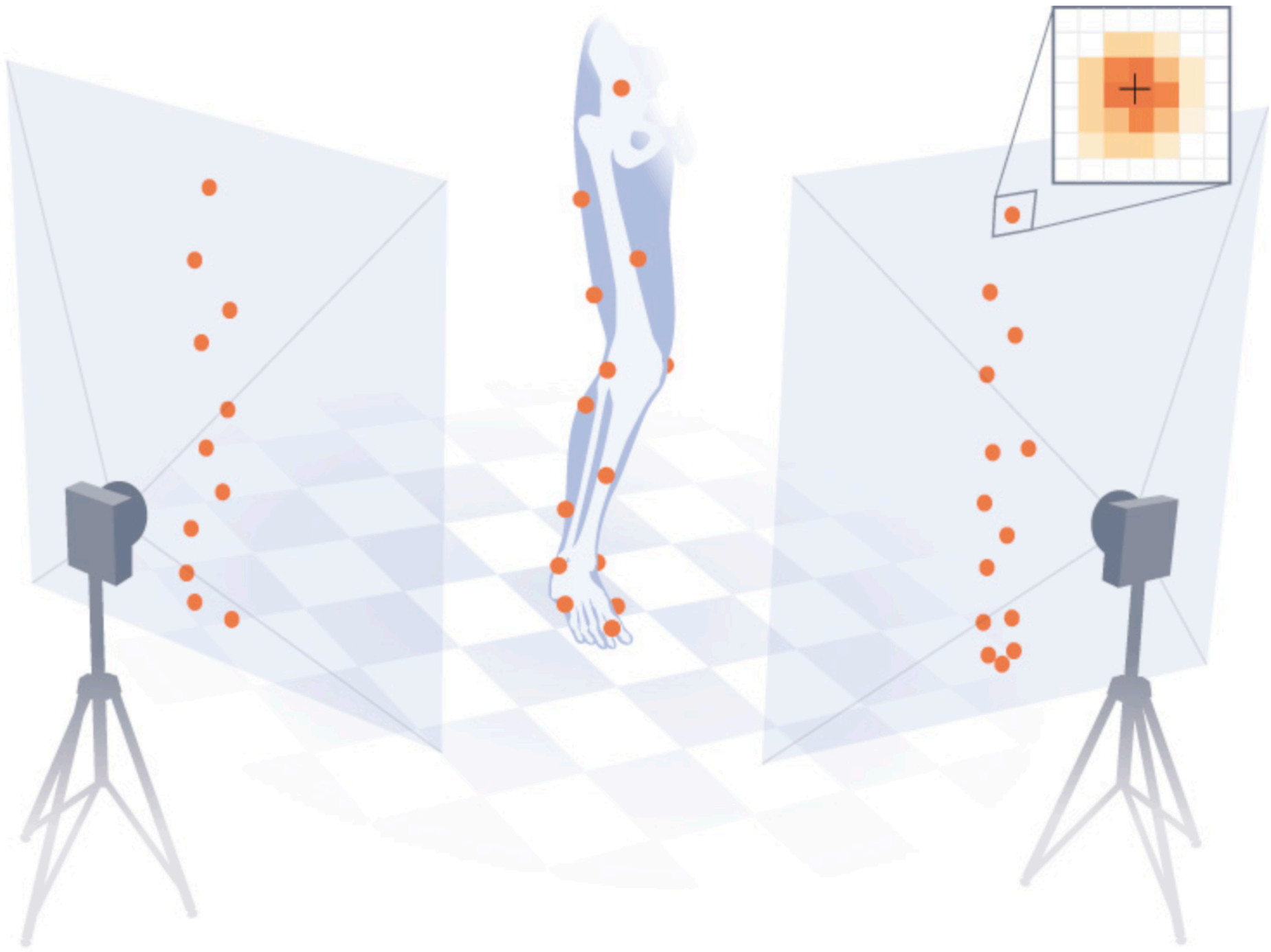


HAB718 Spor Biyomekaniğinde Hareket Analizi



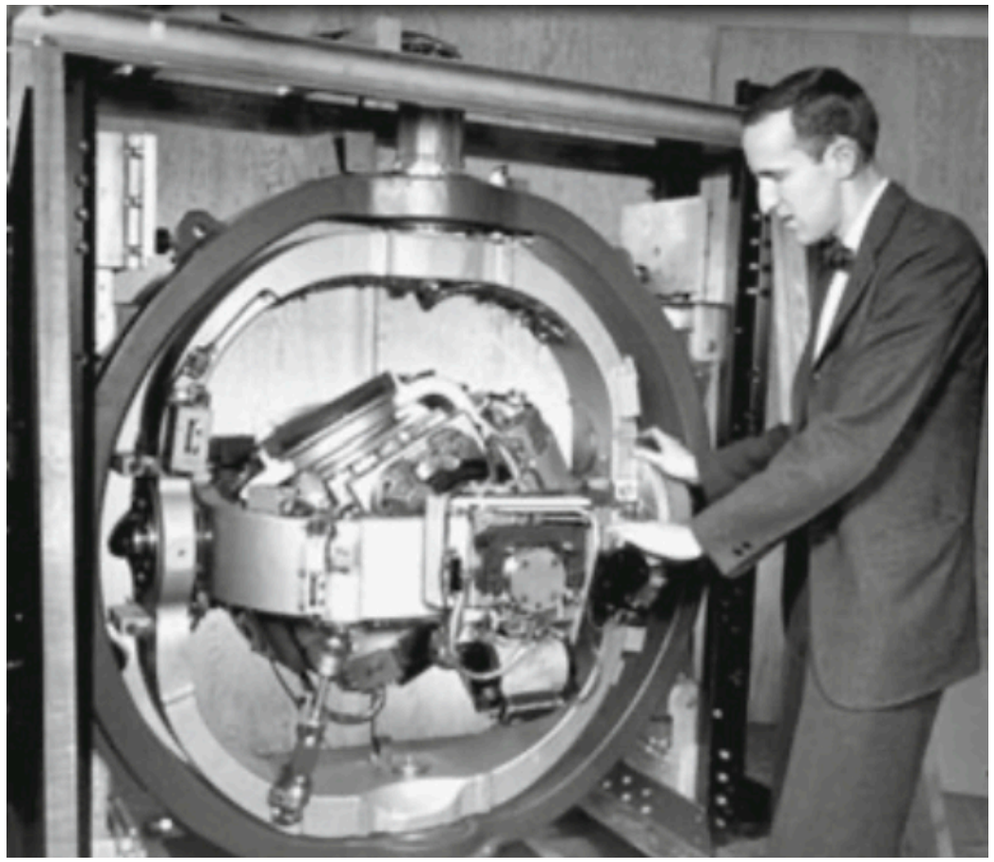
HAB718 Spor Biyomekaniğinde Hareket Analizi

Motion Capture



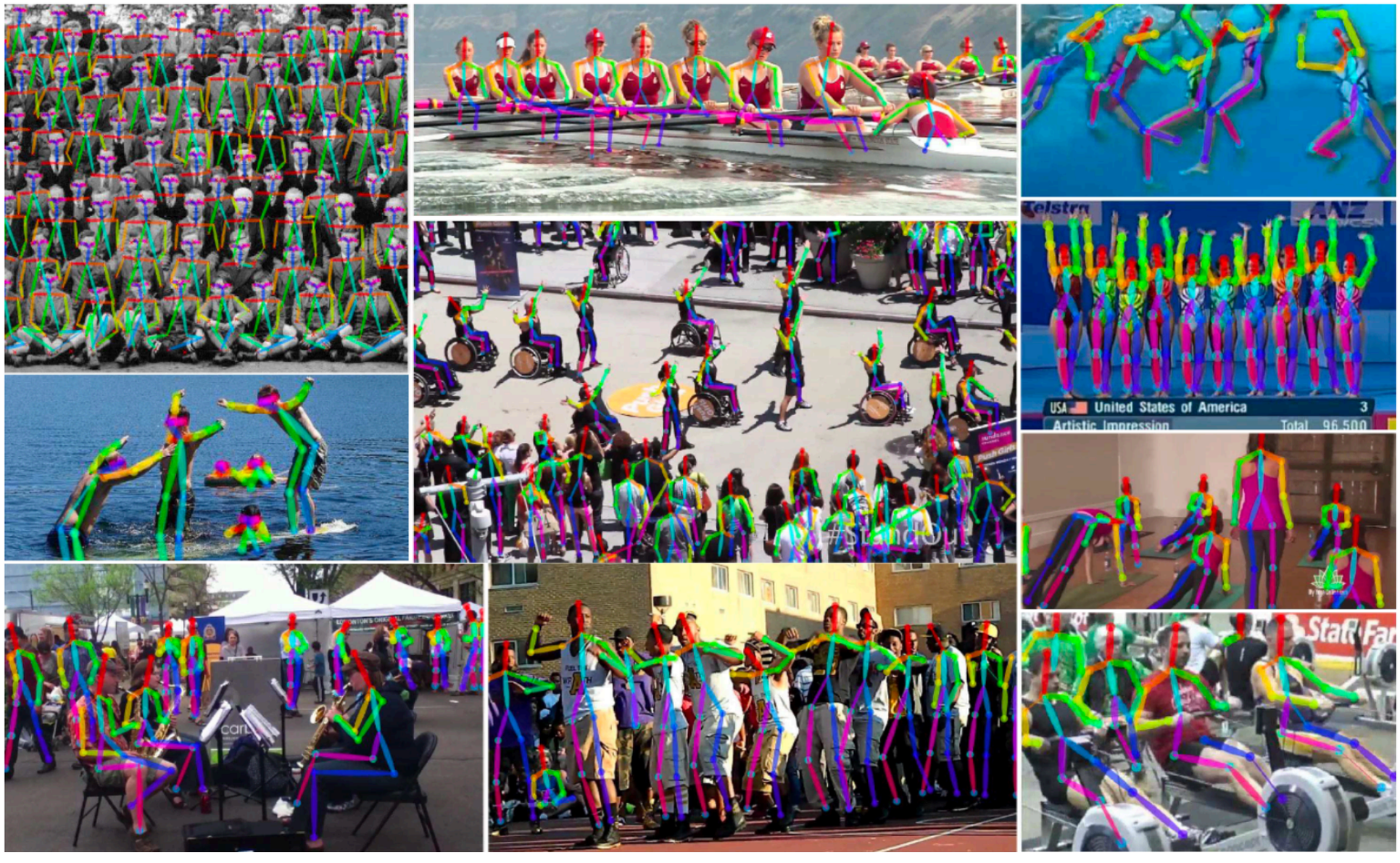
HAB718 Spor Biyomekaniğinde Hareket Analizi

Inertial Measurement Unit



HAB718 Spor Biyomekaniğinde Hareket Analizi

Pose Estimation



HAB718 Spor Biyomekaniğinde Hareket Analizi

Subject Knowledge and Understanding

Demonstrates deep and systematic understanding of specialist areas relevant to this level of study, including:

- depth of knowledge of key theories, concepts, terminology, and facts relevant to the task
- shows mastery of specialist knowledge in depth
- informed by specialist reading around a topic
- demonstration of a critical approach to existing theories and approaches within the discipline, including appreciation of interrelationship with other disciplines
- may suggest new approaches and concepts where relevant

Intellectual Skills

Demonstrates highly abstract conceptualization in familiar and unfamiliar contexts, critical thinking, application and scholarly practice, including

- critical evaluation of ideas and construction of an abstract argument, arguing for alternative approaches where relevant.
- independently designs and undertakes investigations to address areas of practice/theory, selection, and evaluation of methodological approaches to generate data for transformative solutions.
- evaluation and synthesis of digital and non-digital literature to inform responses within unfamiliar situations
- flexible and creative analysis of complex or contradictory data/theories/evidence.

Practical Skills including Digital Capabilities

Demonstrates command of a range of advanced specialized skills adapted to multiple contexts, including:

- mastery of discipline-specific advanced specialist skills in multiple contexts
- processing and interpretation of complex data to generate new information or insights
- works effectively with multiple teams in a variety of contexts as a leader or member, taking into account diversity, recognizes and employs the capacity of others, works with others to anticipate and resolve conflict
- mastery of discipline-specific advanced computational tools and technologies in flexible contexts
- confident application and critical appreciation of other digital literacies including usage of media tools, creation, collaboration and wellbeing.