

Development of health and welfare equipment based on biomechanical evaluation techniques for physical movement

Human centered design: A new development in mechanical systems engineering

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Research objectives

- Development of mathematical models (digital humans) of the human body's biomechanical system and motor control system, and analysis of body movements.
- Development of rehabilitation support technologies for the elderly and disabled, and health and welfare technologies for the general public.

Research Keywords

[Philosophy] Human-centered design: Manufacturing and service creation with the human being at the center.

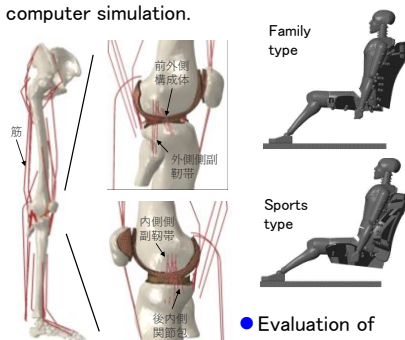
[Application Fields] Welfare engineering, rehabilitation engineering, biomechanics, life support engineering, sports engineering.

[Technologies] Digital humans, multibody dynamics, computer simulation, human augmentation.

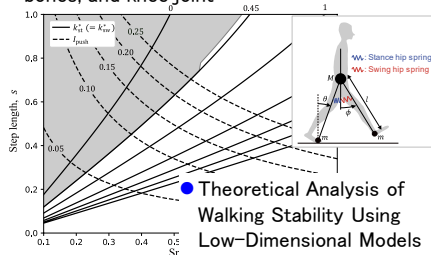
Technology Seed Prediction (Simulation)

Prediction (Simulation) Technology

- Digital human technology (techniques for modeling the musculoskeletal system and the neuromuscular control dynamics of the body)
- Reproducing body movements through computer simulation.



- Evaluation of Automobile Seat Posture Support Characteristics
- Detailed model of the lower limb muscles, bones, and knee joint



Simulation of movement conditions that are difficult or impossible to experiment with, and preliminary predictions of improvement ideas

Equipment and tool development

- Development of equipment and tools based on scientific evidence.
- Pre-assessment using digital human technology.
- Linked with the musculoskeletal model.



- Biomechanical Evaluation of a Wearable Chair. (Worn Work Chair)
- Passive (spring-type) exoskeleton-style (frame-structured) assistive device for caregiving movements.

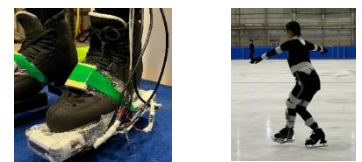


- Writing aid for people with hand and finger motor disabilities.

Digital human technology and device development based on body movement measurement

Measurement and evaluation technology

- 3D measurement technology for body movements, mechanical analysis technology.
- Quantitative and Objective Evaluation of the Effectiveness of Equipment and Tools.
- Simple diagnostic techniques for joint disorders and muscle-tendon injuries.



- World's first!? Six-axis reaction force measurement system for figure skating shoes.
- Measuring Skate Jump Movements Using Inertial Sensors.



- 3D Measurement of Fingers and Shape & Skeletal Modeling.
- Simple Diagnostic System for Finger Tendon Inflammation.

Individual physical function characteristics and mechanical evaluation techniques for equipment and tools

Establishing a new design and development process for health and welfare devices based on human-centered design

Joint research achievements

- Development of a fall prevention training system for the elderly (Hitachi, Ltd., Kitasato university)
- Development and evaluation of walking assistance systems (rubber material manufacturer)
- Evaluation of visibility of automobile driving control systems (automobile manufacturer), and many others.

Other social collaborations

- Elementary mechanics and mechanical engineering education for co-medical staff (prosthetists, orthotists, clinical engineers, etc.)
- Ergonomics and mechanical engineering education for corporate engineers.

Information and Contact Information

Entrepreneurship (returning research results to society)

- HumTec Co., Ltd. was established in April 2023.

Research Lab Website: <https://hase-lab.cpark.tmu.ac.jp/>
Hase's Personal Website: <https://researchmap.jp/read0157790/>
HumTec Co., Ltd. Website: <https://www.humtec.co.jp/>