iCoSys
Institute of Complex Systems

Haute école d'ingénierie et d'architecture Fribourg
Hochschule für Technik und Architektur Freiburg

Innosuisse

DHT

Digital Human Twin for Assistive Robotics and Orthopedics Implants

Realization

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Keywords

- Assistive robotics
- Machine Learning
- Large Scale Simulations
- Digital Twin

Our Skills

Optimization and Learning Framework.

Funding

Innosuisse

Schedule

2024 – 2026

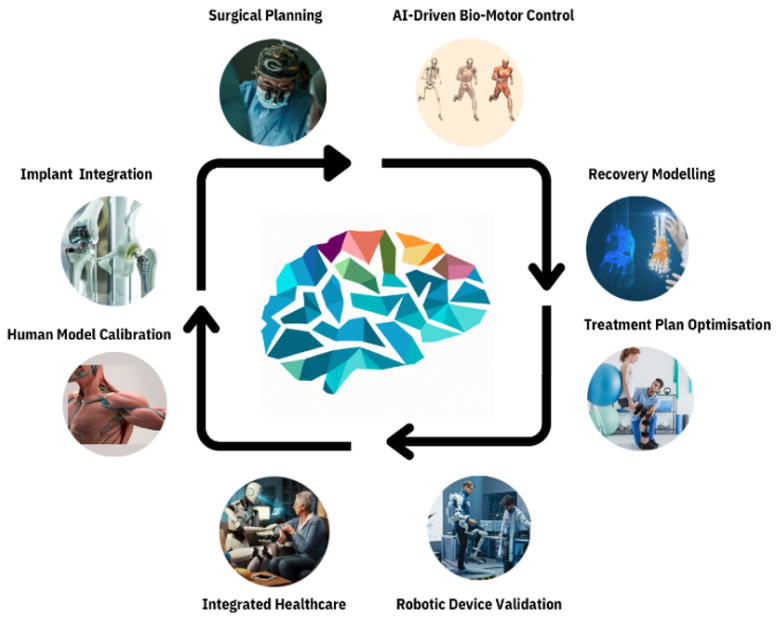

Figure 1: Illustrative schematic of digital human twin for immersive digital healthcare. Various tasks such as implant integration, assistive robotic device validation, treatment plan optimization are performed in the in-silico simulation environment through a coupled mechanics of human and machine interaction.

About the Project

The Digital Human Twin (DHT) operates as a digital representation mirroring an individual's health or disease condition, covering a spectrum of multi-scale, temporal, and interdisciplinary elements to thoroughly delineate physiological and pathological conditions throughout various layers of human anatomy. Formed through the amalgamation of software models and data, DHTs imitate and forecast the behaviors exhibited by their physical counterparts, considering interactions with additional abnormalities. The versatility of this technology in healthcare is evident in its potential applications, including targeted prevention, personalized clinical pathways, and support for healthcare professionals within virtual environments. Instances of its utilization span across various areas, such as clinical trials, medical training, surgical planning, and diverse virtual environments. DHTs are recognized as essential for advancing personalized care, in accordance with Switzerland's core healthcare priorities. Within the domain of musculoskeletal care, the emphasis lies in harnessing the potential of DHTs to simulate the human musculoskeletal system in conjunction with the mechanics of external devices. With the digital twin simulation of the human musculoskeletal system with coupled mechanics of external devices, our focus is two-fold: orthopedic implants and the burgeoning market for assistive robotics. We aim to redefine the landscape of assistive robotics device design, patient-specific treatment planning, and medical device (as orthopedics implant) validation for clinical trial efforts.