MultiScaleHuman

A EU Marie Curie Initial training network

Multi-scale Biological Modalities for Physiological Human articulation

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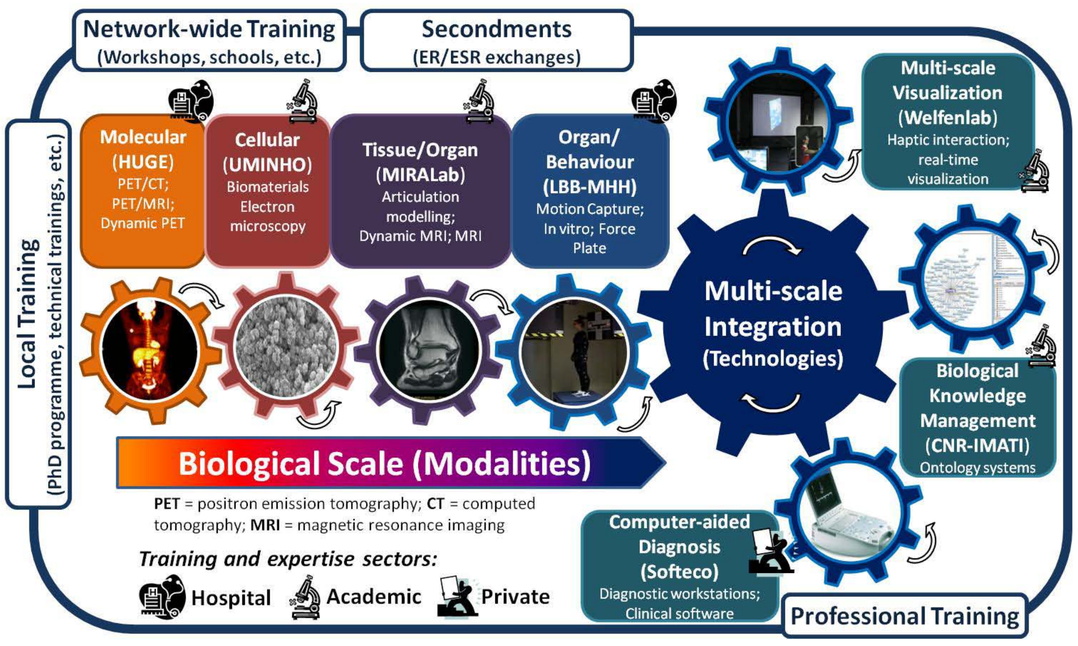
About MultiScaleHuman

The goal of **Multi-scale Biological modalities for** physiological **human articulation (MultiScaleHuman) is** to research by **training early stage researchers** (ESR) and **experienced researchers (ER) in the** creation of a multi-scale biological data visualization and knowledge management system for improved **understanding, diagnosis and treatment of physiological** human articulation. MultiScaleHuman will narrow its ambitious research towards a very important and challenging healthcare problem of musculoskeletal diseases (MSD) and related disorders.

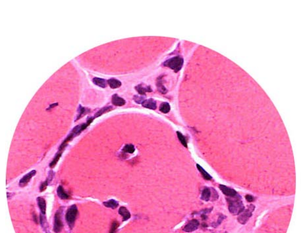


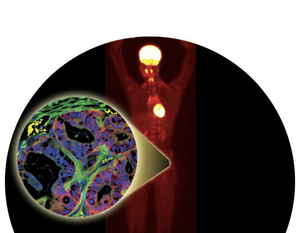
Project description

MultiScaleHuman aims to visualize in 3D the functioning of the human body from a **dynamic multi-scale** point of view. It will lead to a better understanding of joint-related diseases in order to diagnose and treat patients more efficiently.

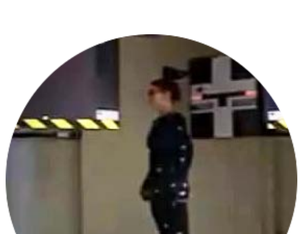
Musculoskeletal diseases (MSD) and related disorders are often considered as an inevitable consequence of aging, accounting for the largest fraction of temporary and permanent disability. Many MSD lead to **joint pain, stiffness and limited motion, affecting** all human body articulations. So far, doctors have been using scans to diagnose a patient. Today, the MultiScaleHuman project aims to recreate a patient's leg on a computer so that doctors have the possibility of examining in 3D the functioning of joints.

For the first time, researchers will create a **predictive 3D simulating** model - starting from the knee, which is one of the areas most affected by MSD - from various levels: **molecular, cellular, organic, metabolic and behavioral.** This is what we call multi-scale visualization.


Molecular


Cellular


Organic acquisition


Behavior

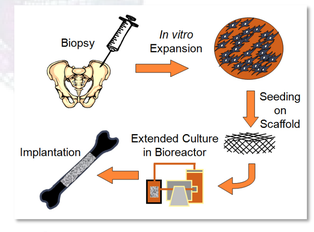
Involved partners

This project is based upon a strong network of expertise in which each partner brings its know-how and knowledge from three different research environments: **academic** (education), **hospital (social actors) and private (industry).**

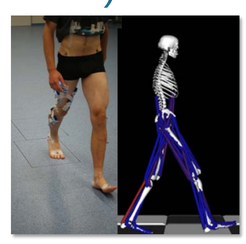
1. MIRALab, Université de Genève, Switzerland (UNIGE)
   Coordinator
   - Anatomical modeling from medical images
   - Deformable model based image segmentation
   - Integrated framework for human articulation function analysis

2. Les Hôpitaux Universitaires de Genève, Switzerland (HUGE)
   - Multi modality image registration for generation of parametric functional images
   - Functional evolution and modeling of muscular activity from dynamic images

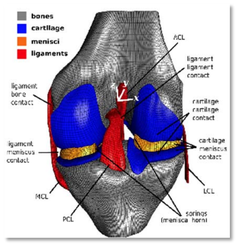
3. Universidade do Minho, Portugal (UMINHO)
   - Understanding cellular behavior for developing MSD treatment
   - Development and investigation of the biological performance of scaffolds
   - Optimization of cell seeding and culturing conditions for the growth of tissue substitutes in vitro



4. Medizinische Hochschule Hannover, Germany (LBB-MHH)
   - Patient specific data for diagnosis and treatment
   - Musculoskeletal and kinetic analysis
   - Development of advanced techniques for registering motion analysis data



5. Consiglio Nazionale Delle Ricerche, Italy (CNR-IMATI)
   - Physiological human ontology
   - Feedback from partners for validation
   - Knowledge base development



6. Softeco Sismat Srl, Italy (Softeco)
   - Integration of modules developed by the partners
   - Design and development of a musculo-skeletal related CAD system usable in clinical environments
   - With consideration of industrial and clinical issues

Disease tracking and follow-up (eg RHEUMAScore – Softeco)

7. Gottfried Wilhelm Leibniz Universität Hannover, Germany (Welfenlab)
   - Integrated multi scale visualization system
   - Allow quantitative assessment (quantitative biology)
   - VR based interaction with 3D data

http://multiscalehuman.miralab.ch