Posture and Movement Analysis Lab
‘Luigi Divieti’

www.movlab.polimi.it

Posture and Movement Analysis Lab 'Luigi Divieti'

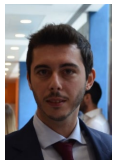
FACULTY MEMBERS

Manuela Galli
Full Professor
Director

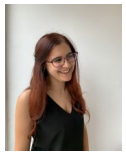
Veronica Cimolin
Associate Professor

Marcello Crivellini
Past Director

MOVEMENT ANALYSIS FOR CLINIC-REHABILITATION

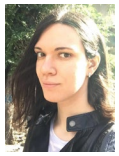


Federico Temporiti



Cristina Ferrario

Cecilia Monoli

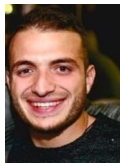


Serena Cerfoglio

SPORT BIOMECHANICS and ERGONOMY

Federica Camuncoli

Flavia Marrone



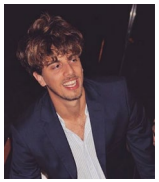
Filippo Bertozzi

Greta Simoni

CLINICAL ENGINEERING

Serena Mandaresu

Matteo Verga



Paola Picozzi

Collaborations

Hospitals

- IRCCS San Raffaele – Pisana Tosinvest Sanità, Roma
- Casa di Cura San Raffaele Cassino, Tosinvest Sanità, Cassino (FR)
- Ospedale San Giuseppe, Istituto Auxologico Italiano, Piancavallo (VB)
- IRCCS “Eugenio Medea” Associazione La Nostra Famiglia, Bosisio Parini (LC)
- IRCCS Humanitas research Hospital, Rozzano (MI)
- Sociedad pro ayuda del Niño Lisiado Instituto de rehabilitacion infantil Teleton Santiago, Cile
- Centro de Rehabilitación Infantil TELETON CRIT, Mexico City, Mexico

Companies

- BTSBioengineering, Italy
- ITOP, Italy
- Cometa, Italy
- Enel distribution, Italy
- Euleria, Italy
- Ecker Technologies, Switzerland

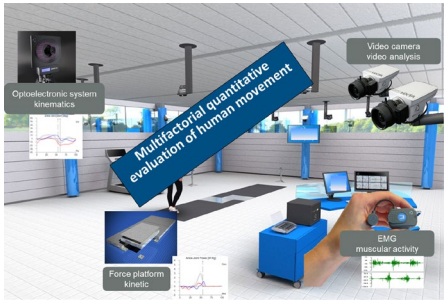
Universities

- Università degli Studi di Cagliari, Cagliari
- Università degli Studi di Milano
- Università degli Studi di Brescia, Brescia
- Università la Sapienza, Roma
- Universidad de Concepciòn, Concepciòn, Cile
- University of Tartu, Tartu, Estonia
- University Center of Anápolis, Brasil
- Fundação Universidade Federal de Ciências da Saúde de Porto Alegre, Porto Alegre, Brasil
- Faculdad de Medicina, Universidad de Chile, Santiago, Cile

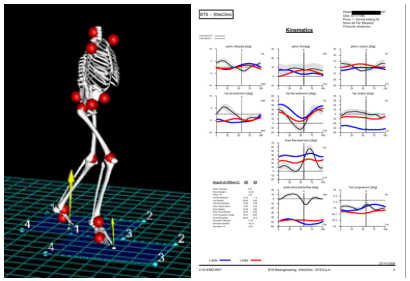
Clinical Movement Analysis

Keywords: kinematic, kinetic, EMG, rehabilitation, gait

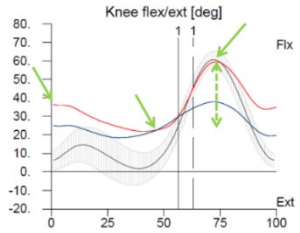
Movement analysis for clinical applications



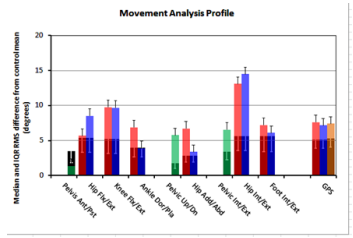
GAIT ANALYSIS



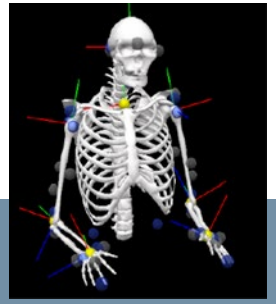
Specific parameters



Summary parameters (GGI, GDI, GPS, …)



NEW EXPERIMENTAL SET-UP



Collaborations

- IRCCS Istituto Auxologico Italiano, Piancavallo (VB)
- IRCCS San Raffaele Pisana, Tosinvest Sanità, Roma
- IRCCS Eugenio Medea, Bosisio Parini (LC)
- Università degli Studi di Cagliari
- UNINOVE, San Paolo (Brazil)
- UFCSPA, Porto Alegre (Brazil)

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Clinical Movement Analysis

indoor

outdoor

Kinematics

EMG

Metabolimeter

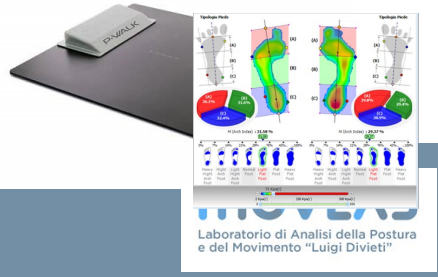
Inertial Sensors

Kinetics

Video

3d Scanning

Baropodometry

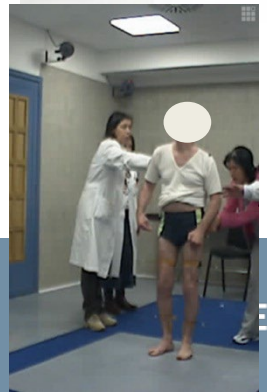
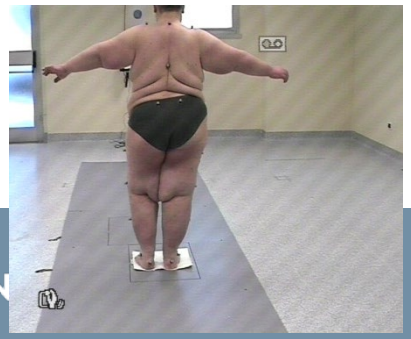


Clinical Movement Analysis

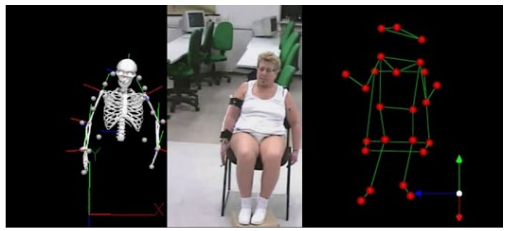
Several pathologies

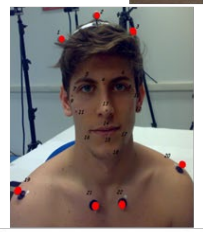
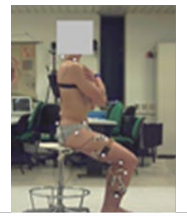
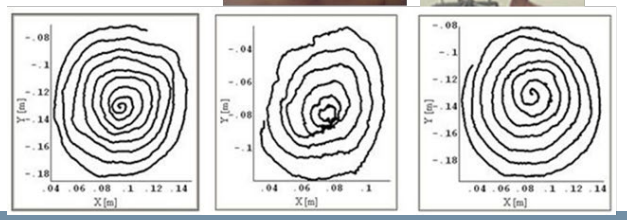




Several movements

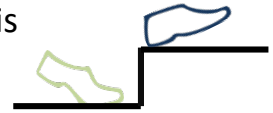


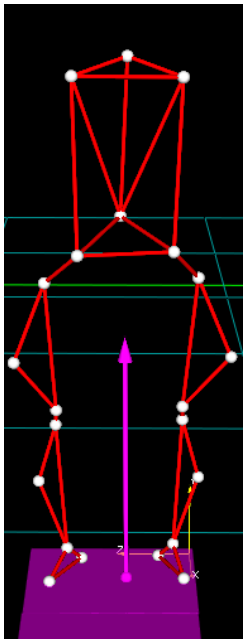





Clinical Movement Analysis

Biomechanical characterization of patients with Down Syndrome: an energetic, kinematic and dynamic analysis

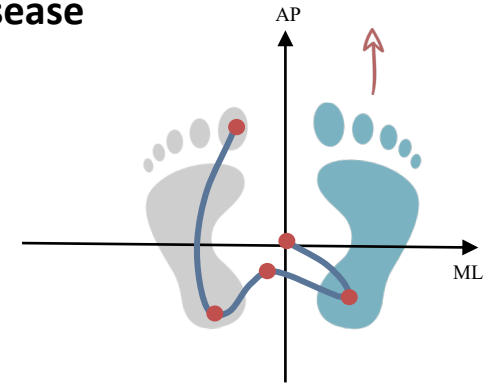
Keywords: Down Syndrome, Alzheimer disease, energetic, kinematic, dynamic and posturographic analysis





Description:

to define a **biomechanical characterization** of patients with Down Syndrome in terms of energetic, kinematic and dynamic analysis. This also allow the definition a **predictor for neurological or degenerative disease such as Alzheimer disease**



DIPARTIMENTO DI MECCANICA
mecc PhD

IRCCS San Raffaele
Roma

POLITECNICO
MILANO 1863
DIPARTIMENTO DI ELETTRONICA
INFORMAZIONE E BIOINGEGNERIA

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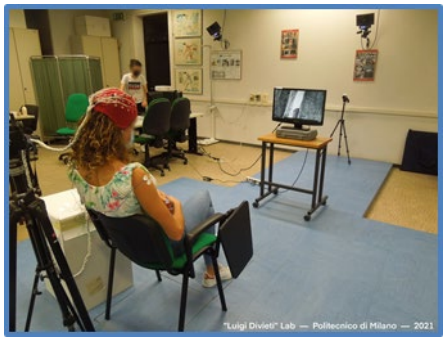
Clinical Movement Analysis

Keywords: Action Observation Therapy; Sleep; Motor learning; postural stability; Manual dexterity

Description:

The aim is to investigate the effects of **Action Observation Therapy** (AOT) followed by sleep on

1) **postural stability** in **healthy subjects or in older adults**. The investigation will be carried out using **functional** and **instrumental** outcome measures. The short-term (at the end of the training) and the mid-term (1 month after the end of the training) effects will be assessed.
2) **manual dexterity** in **patients with immobilization after hand elective surgery**. The investigation will be carried out using **functional, instrumental and neurophysiological** integrated outcome measures. The short-term (at the end of the immobilization period) and the mid-term effects will be investigated.



IRCCS HUMANITAS RESEARCH HOSPITAL

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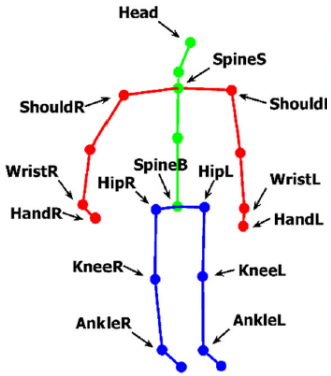
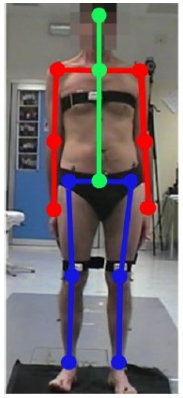
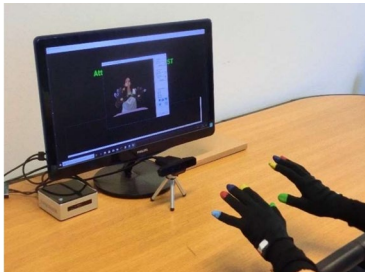
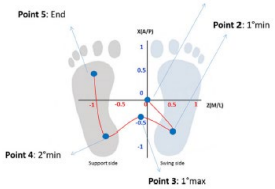
Clinical Movement Analysis

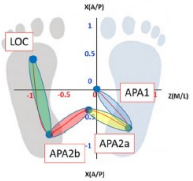
Estimation and validation of gait/other movement patterns and parameters by means of **wearable technology** and equipment for **ecological assessments** (single RGB-D sensor, IMUs, …), evaluation of therapeutic interventions (eg. Whole Body Cryostimulation, manual therapy, …)

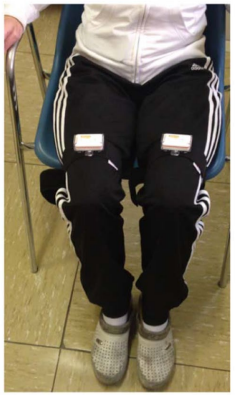












Collaborations:

- ❑ Istituto Auxologico Italiano
- ❑ IEIIT – CNR Torino
- ❑ Università degli Studi di Brescia
- ❑ Euleria, Italy
- ❑ Clinica Hildebrand – Centro di riabilitazione Brissago

Keywords: kinematic, wereable, RGB-D sensors, rehabilitation, gait, posture, tele-rehabilitation

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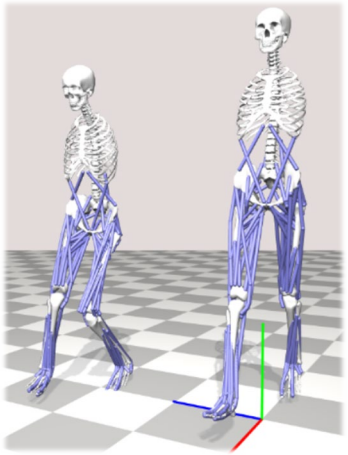
Movement Analysis and Musculoskeletal Models

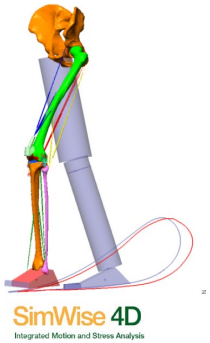
Keywords: dynamic simulation - musculoskeletal modelling - movement analysis - joint biomechanics

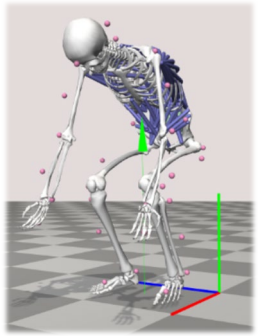


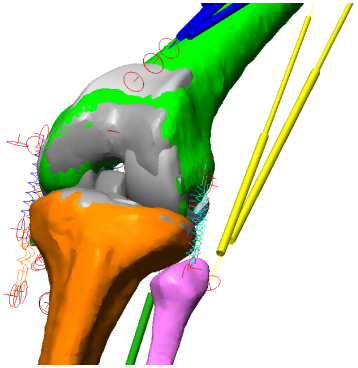
DESCRIPTION

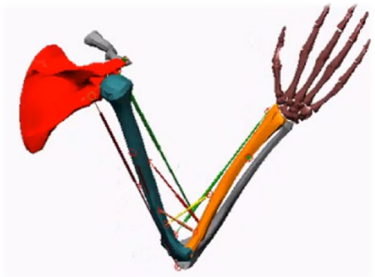
Combining movement analysis and computational approaches:

- ❑ *for the development and validation of generic and customised musculoskeletal models of human body*
- ❑ *for further investigating joints biomechanics under physiological and pathological conditions*
- ❑ *for evaluating biomechanical effects of different prosthetic implantation techniques*







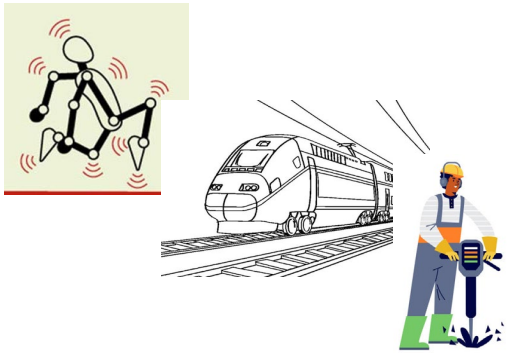


Collaborations

IRCCS Istituto Ortopedico Galeazzi – Istituto Ortopedico Rizzoli (IOR) – Italian Institute of Technology (IIT)
Orthopaedic companies and Rehabilitation centres – Centro Protesi INAIL di Budrio

Contacts: carlo.frigo@polimi.it lucia.donno@polimi.it

Biomedical + Mechanical Engineering

Area 1: HUMAN RESPONSE to VIBRATION	Area 2: BIOMECHANICS in CLINICS	Area 3: Collaboration with private companies
Description Evaluate **vibrations exposure** effects on gait, posture and cognitive abilities for workers.  **Keywords:** whole-body vibrations; cognitive performance; perturbed gait; work enviroments.	**Description** Assess **reaction time** and motion response to visual stimuli in children with cognitive impariments.  **Keywords:** motion analysis; rehabilitation; reaction time; cognitive disorder.	**Description** ACTUAL PROJECT → Make the **manufacturing process** of personalized medical devices **automated** with artificial intelligence algorithms.  **Keywords:** automated production process; artificilal intelligence; medical device.

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Sport Biomechanics

Keywords: kinematic, kinetic, wearable, sport, athletes

Description:

- To identify the **identity card of the athletes** and evaluate the predisposition / talent of the youngest
- To optimize strategy and training for the **safety and performance** of athletes in the real world
- To optimize the **equipment** according to the athlete and the environment
- To build and feed longitudinal databases that allow to **evaluate the cost-effectiveness** and **safety** of the training strategies and used equipment

Collaborations

UNIVERSITÀ DEGLI STUDI DI MILANO

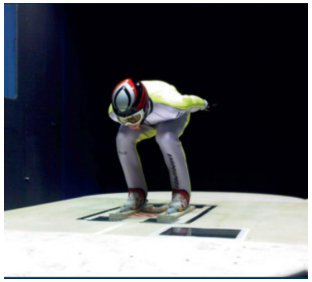
BTS Bioengineering

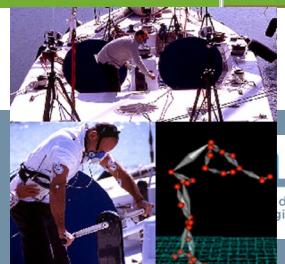
Euleria The land of measurements

POLITECNICO MILANO 1863 POLO TERRITORIALE DI LECCO

F.I.S.I.

DIPARTIMENTO DI MECCANICA mecc PhD





Contacts: manuela.galli@polimi.it

Clinical + Sport Biomechanics

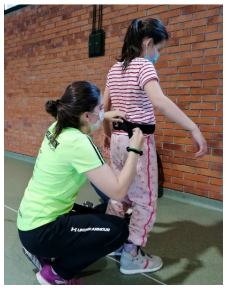
Keywords: Running, Rowing, Cerebral Palsy, Hemiplegia.

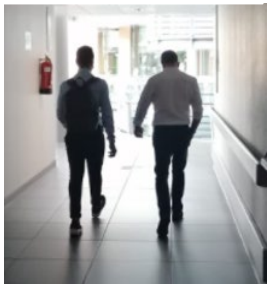
Description:

- to assess **sports activities** in **children** with hemiplegia.
- to promote though **motion analysis** the possibility of a "SPORT FOR ALL".

Collaborations





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MOTION ANALYSIS THROUGH MIXED PERCEPTION

Keywords: motion analysis, gait analysis, wearable devices, rehabilitation, IMU, water rehabilitation, sport climbing, adapted sport

Description: motion analysis outside the motion laboratory, in challenging conditions, combining *sensing modalities* and novel data processing, analysis, tools, and examination methods.

ACCEPT
Adaptive Climbing for CErebral Palsy Training

ACCEPT: adapted sport climbing as rehabilitation and evaluation tool for Cerebral Palsy children

Gait analysis, motion investigation and biomechanical modelling ***underwater*** for rehabilitation purpose

TAL TECH

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Clinical Engineering

Keywords: Healthcare systems, organization models, Quality Management System, Medical technologies, Risk analysis and management

Description:

Development and management of **biomedical technology** in clinical institutes and hospitals, preparation of **documents** to support medical equipment and devices, **digital technologies**, **medical device regulation**, **care quality** and **innovation**, management and equipment **costs**, **healthcare systems**

Collaborations

- ASST Spedali Civili di Brescia
- ASST Grande Ospedale Metropolitano Niguarda, Milano
- ASST Vimercate (MB)
- Ospedale San Raffaele, Milano
- IRCCS Istituto Nazionale dei Tumori, Milano
- Dipartimento di Ingegneria Gestionale, Politecnico di Milano

Contacts: veronica.cimolin@polimi.it; marcello.crivellini@polimi.it

OSPEDALE SAN RAFFAELE

osservatori.net digital innovation

Sistema Socio Sanitario Regione Lombardia ASST Spedali Civili

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Sistema Socio Sanitario Regione Lombardia

Sistema Socio Sanitario Regione Lombardia ASST Brianza

Ospedale Niguarda
Sistema Socio Sanitario Regione Lombardia

POLITECNICO MILANO 1863 SCHOOL OF MANAGEMENT