



XII International Symposium on 3D Analysis of Human Movement, Bologna (Italy), 18-20 July 2012: “Technology & Treatment”



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XII 3DAHM Symposium, 18-20 July 2012, Bologna, Italy

Bologna: the City



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Istituto Ortopedico Rizzoli





the Congress Venue



Centro di Ricerche Codivilla-Putti

(Istituto Ortopedico Rizzoli, via di Barbiano 1/10 – 40128 Bologna)



Movement Analysis Lab



Alberto Leardini, DPhil



3D Fluoroscopy

Movement Analysis

Joint Modelling



R.S.A.

Surgical Navigation



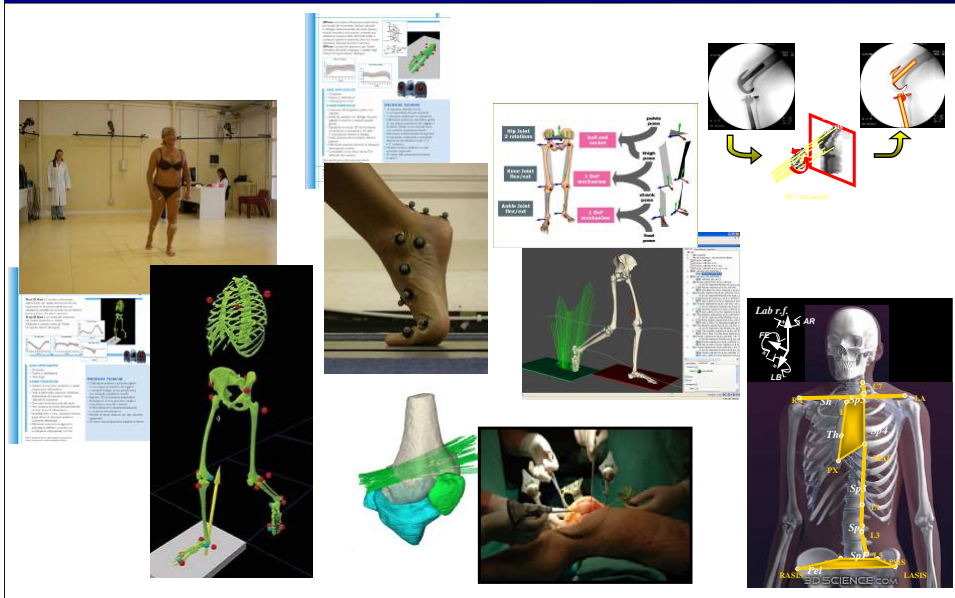
Prosthesis Design



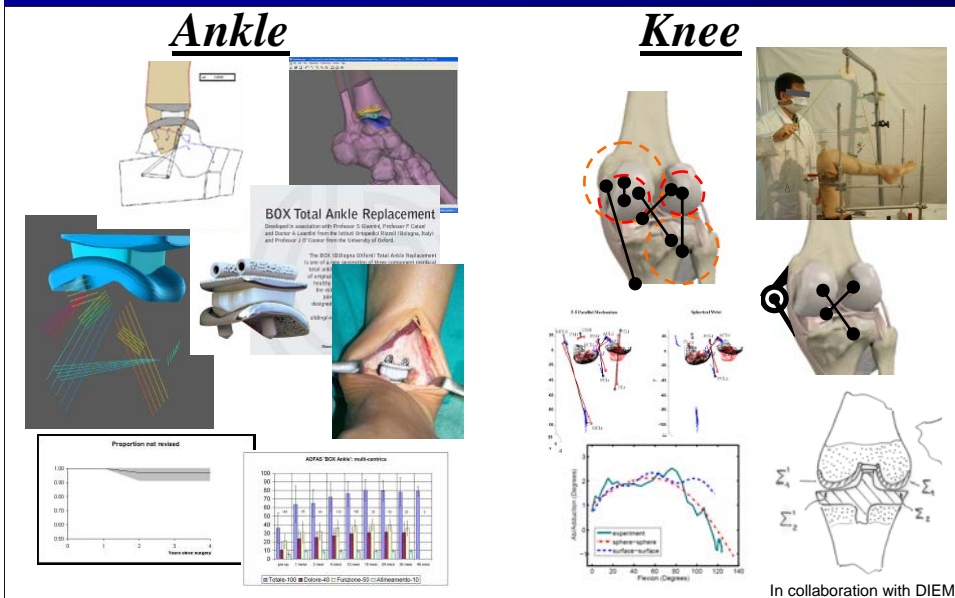
- Planning of the Correct Surgery
- Monitoring Functional Performance
- Earlier Prognosis of Implant Failure
- Design of New Prostheses

Sandro Giannini, Fabio Catani,
Mariagrazia Benedetti, Claudio Belvedere,
Lisa Berti, Francesco Cenni

IOR-MAL: New Techniques



IOR-MAL: New Replacements

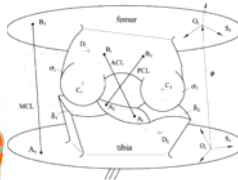
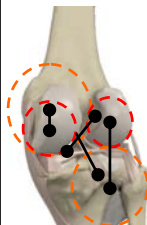




Prof. Vincenzo Parenti-Castelli

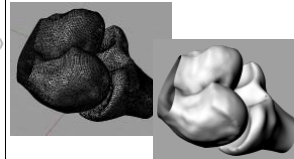
KNEE AND ANKLE INTERNAL PROSTHESES

Ankle and knee natural joint motion is obtained from in-vitro experimental analyses.



Based on this and on the articular geometry, mathematical models of the articulations are defined. The mechanisms obtained are the starting points for the design of new prostheses.

Four prototypes of TKR have been devised (objects of **two international patents** owned by University of Bologna and Istituto Ortopedico Rizzoli).



The prototypes are implanted back in the original specimens to validate their efficiency.

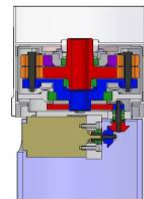
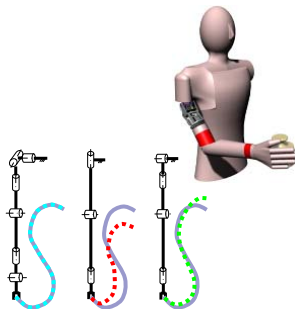
*In collaboration with Istituto Ortopedico Rizzoli

Nicola Sancisi, Riccardo Franci, Andrea Ottoboni, Benedetta Baldisserri



UPPER LIMB EXTERNAL PROSTHESES*

The prosthetic limbs are the best compromise between functionality and wearability: the prosthesis has to be able to replicate the natural motion during some particular customary daily actions.



A **shoulder myoelectric prosthesis** and a **humeral rotator** have been designed. The prototypes have been made at laboratories of DIEM (University of Bologna) and INAIL.

Experimental tests have been performed in laboratory and with patients to verify the capability of the designed prostheses.



*In collaboration with INAIL.

Parenti-Castelli Vincenzo,
Troncosi Marco, Caminati Raffaele

Team

The INAIL Prostheses Centre is a specialized division of **INAIL**, the **Italian Workers' Compensation Authority**.

The R&D Directorate will support the organization of the conference through its **Motion Analysis** and **Mechatronics Labs** (managers: Andrea Giovanni Cutti, PhD and Emanuele Gruppioni, MEng).



Main R&D Topics

- 1) Development of motion analysis protocols and technologies, in particular for out-of-the-lab measurements



- 2) Clinical trials of third-party prosthetic technologies



- 3) Development of new assistive devices and prostheses





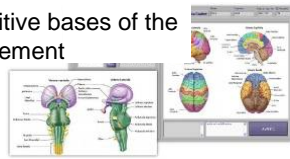
Biomechanical analysis and 3D human tracking



Angelo Cappello
Full Professor
angelo.cappello@unibo.it

Kinematics and dynamics evaluation

- Accelerometry-based measurement systems
- Prosthetic control strategies through EMG and inertial sensors
- Neuro-cognitive bases of the human movement



People:
E. Borelli, V.L. Fuschillo, F. Bagalà

Collaborations:
INAIL (Budrio, Italy)
Montecatone Rehabilitation Institute (Bologna, Italy)

3D human tracking

- Visual-inertial sensors for human localization
- Monitoring ADL
- Fall detection



DEPARTMENT OF ELECTRONICS, COMPUTER SCIENCES AND SYSTEMS, DEIS, UNIVERSITÀ DI BOLOGNA



Motor control and wearable systems



Lorenzo Chiari
Assistant Professor
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Motion analysis in neurological disorders

- Parkinson's disease and functional neuro-surgery
- Multifactorial evaluation of Parkinson's disease (movement, cognition, neuroanatomy & neurophysiology)



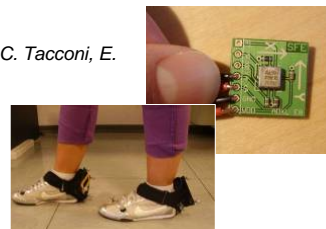
People:
L. Rocchi, M. Mancini, S. Mellone,
L. Palmerini, T. Mayberry

Collaborations:
Oregon Health and Science University (Portland OR, USA)
Center of Neurology, Dept of Neurodegeneration, University of Tübingen (Germany)
Dept of Neuroscience and Rehabilitation, Ospedale S. Anna (Ferrara, Italy)

Wearable systems

- Inertial sensors, activity classification and personal health

People:
L. Rocchi, C. Tacconi, E. Farella



Collaborations:
Micrel Lab, University of Bologna, Italy
ST Microelectronics, Italy
McRoberts, Moving Technology (NL)

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Measurement methods and models



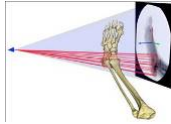
Rita Stagni
Assistant Professor
rita.stagni@unibo.it

Reliable measures and protocols

- STA quantification and compensation
- 3D Fluoroscopy methodology
- Robust protocols for special applications

People:

S. Fantozzi, L. Terzi



Collaborations:
DIE, Department of Electrical Engineering, University of Padova
LAM – AUSL di Reggio Emilia, Osp. di Correggio

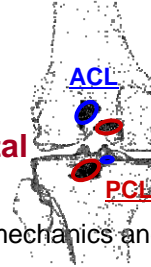
Musculoskeletal models

- Total-body biomechanics and metabolics
- Muscle force estimation
- Motion stability estimation
- Knee biomechanics

People:

M.C. Bisi, F. Riva

Collaborations:
LTM, Istituto Ortopedico Rizzoli
Research Institute MOVE, VU University of Amsterdam, The Netherland



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Sport Motion Analysis



Silvia Fantozzi
Assistant Professor
silvia.fantozzi@unibo.it

Stereophotogrammetry

- Wheel-chair Tennis
- Roller Skating
- Volleyball
- ..



Collaboration:
Faculty of Exercise and Sport Sciences,
University of Bologna

Markerless

- Swimming



Collaboration:
DIE, Department of Electrical Engineering,
University of Padova

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University of Sassari Biomechanics Group

Ugo Della Croce, PhD - Full Professor

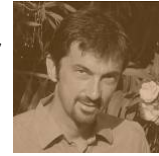
Andrea Cereatti PhD - Assistant Professor

Elena Aiello MD – Assistant Professor

Elif Surer Kose – PhD Student

Alper Kose – PhD Student

Agnese Peruzzi – PhD Student



Research Activity:

Movement Analysis Methodology

Joint Mechanics

Markerless Motion Capture

Human Physical Activity Monitoring

Motor Rehabilitation with VR applications



AIMA (Advanced Imaging and Movement Analysis) laboratory



One 10-camera motion system

One 6-camera motion system

2 Force Platforms

16-channel EMG system

One 7 and one 2 inertial sensor
Units

2 footswitches

1 visor (3D+IMU) system



Alghero, Sardinia



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... after previous successful international Congresses



... see you in Bologna 2012!