FP7 EU Projects:

Active Contraints Technologies for Ill-defined or Volatile Environments—ACTIVE
FP7-ICT-2009-6-270460  2.1 - Cognitive Systems and Robotics
www.active-fp7.eu

MULTimodal Neuroprosthesys for Daily Upper limb Support—MUNDUS
FP7-ICT-2009-5-248326  7.2 - Accessible and Assistive ICT
www.mundus-project.eu

Realistic Real-time Networks: computation dynamics in the cerebellum—Realnet
FP7-ICT-2009-6-270434  8.8 - Brain-inspired ICT
www.realnet.fp7.eu

ROBOT and sensors integration for Computer Assisted Surgery and Therapy—ROBOCAST
FP7-ICT-2007-1-215190  2.1 - Cognitive Systems and Robotics
www.robocast.eu

EUropean RObotic SURGEy—EUROSURGE
FP7-ICT-2010-7 -288233  2.1 Cognitive Systems and Robotics

NeuroEngineering and medicAl Robotics LABoratory

www.biomed.polimi.it/nearlab

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NeuroEngineering and medical Robotics Laboratory

The Neuroengineering and medical robotics Laboratory is part of the Bioengineering Department of Politecnico di Milano and includes two sections, one which deals with the neural engineering and one which works in the field of medical robotics. The Neuroengineering Section aims at developing topics in neuroengineering as biomimetic neuroprostheses, bioartificial interfaces, motor control modelling. The Medical Robotics Section is mainly devoted to biomechanics and computer assisted and robotic surgery.

NeuroEngineering Section (NES)

NES research activities are organized into three topics:

1. Motor control and biomechanics
   - Innovative protocols (short and very long term gravity, virtual reality, altered equilibrium conditions, sensorial perturbations) for the study of sensorimotor integration and movement planning control
   - Computational and biomechanical modelling and simulations for motor control understanding.

2. Neurorehabilitation and Neuroportheses
   - Integration of electrical stimulation with robotic systems for rehabilitation and assistance to daily life activities of people affected by neuromotor diseases
   - Methods, devices and new protocols for the study of recovery in neurological patients (fMRI coupled with motion analysis, H-reflex)
   - Development and design of neural (soft computing) controllers for functional electrical stimulation optimisation.

3. Bioartificial interfaces
   - Development of microtechnologies for multisite electrophysiology and photonics coupled with in vitro neuronal cultures
   - Software design for quantitative pharmacological and toxicological screening.

Medical Robotics Section (MRS)

The Medical Robotic Section (MRS) main goal is the development of innovative methods and devices for clinical and surgical applications.

Main current research topics at MRS are:

1. Surgical planning and navigation
   - Automatic and intelligent planners for neurosurgical keyhole interventions (biopsy, DBS electrodes placements and stereo EEG)
   - Robust functional Hip joint center identification in knee arthroplasty interventions
   - New software for sensors fusion in surgical navigation.

2. Surgical robotics
   - Sensors fusion in surgical robotics and navigation
   - Motion compensation in awake robotic neurosurgery
   - Force feedback and haptics in minimally invasive surgery
   - Ontologies for robotic surgical systems.

3. Micro-devices for surgery
   - Micro-robots propulsion and control for soft tissue burrowing.