

# Multimodal robotics platform for micro-force measurement and mechanical characterization

## Research framework

The adhesion between a micro-nano-object and a micro-gripper end-effector is an important problem in micromanipulation. Cancellation or reduction of this force is a great challenge. The evaluation of **plane-plane contact** force has become a big issue in micro/nano micro-assembly. Reliable experimental equipments are needed to validate research works done on plane-plane interactions (theoretical formulations or virtual simulations with finite elements).

## Multimodal platform characteristic

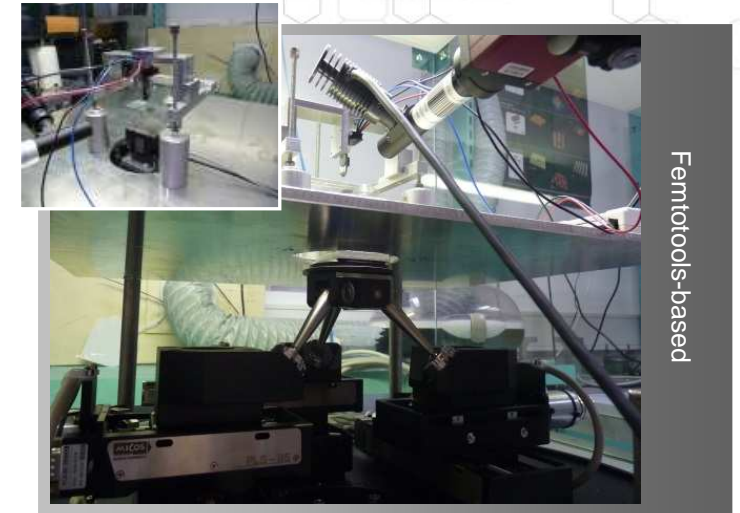
A micro-force sensor probe tip (either Femtotools sensor or AFM cantilever) associated to a piezoelectric nano-translator and a precision parallel robot are used to obtain an **integrated robotics system**. This system is currently used for micro-force measurement induced by a plane-plane contact.

In the proposed system, the two micro-objects whose mechanical interaction needs to be characterized are fixed on the parallel robot end-platform and on the micro-force sensor probe tip respectively. This high precision robotics system is used to provide six degrees-of-freedom motion between both objects. So this platform is convenient for the measurement of micro-forces occurring between planar objects with different orientations.

As a significant application, the proposed system is used for the measurement of pull-off force between planar objects. In the future, it will also be used to measure friction forces in the context of multi-asperity nano-tribology.

**Major article:** Kinematics parameters estimation for an AFM/Robot integrated micro-force measurement system. Dong W., Rostoucher D., Gauthier M. in IEEE/RSJ International Conference on Intelligent Robots and Systems, IROS'10, Taiwan (2010).

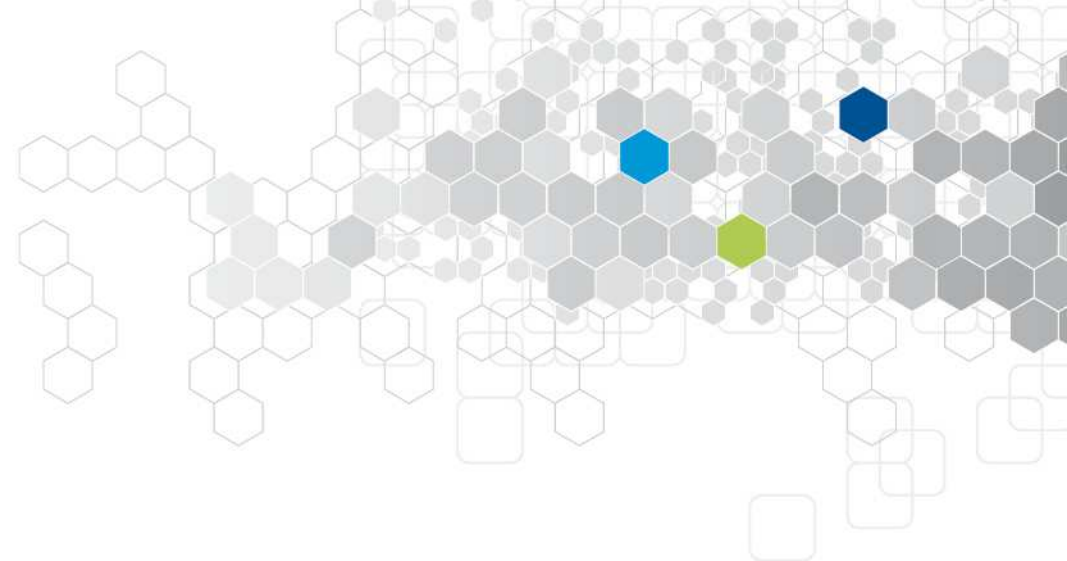
Contact: [patrick.rougeot@femto-st.fr](mailto:patrick.rougeot@femto-st.fr)



Micro-force measurement multimodal platform using a Femtotools sensor



Micro-force measurement multimodal platform using an AFM cantilever



# SPECIMeN Group

Sensing strategies, Perception and  
Characterization at Micro- and Nano-scales

AS2M Dep<sup>t</sup> – Automatic Control and Micro-Mechatronic Systems

