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Development of a Smart Nanorobot for Sensor-based Handling in a Scanning Electron Microscope ROBOSEM GRD1-2001-41861

COORDINATOR

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•Medplant Genetics, Bilbao, Spain
•Klocke Nanotechnik, Aachen, Germany
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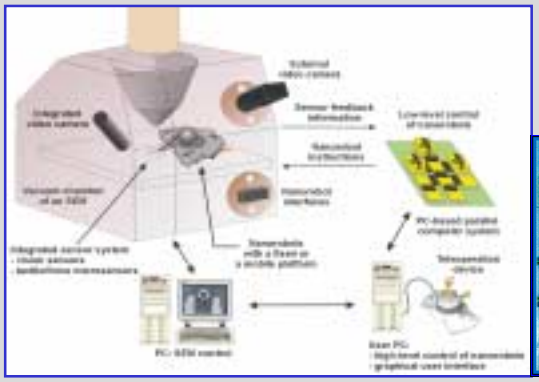
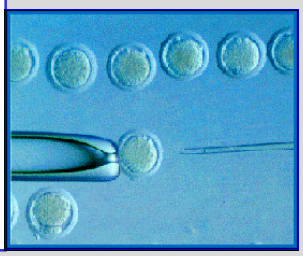
PROJECT DESCRIPTION

Tremendous development of micro- and nanotechnology calls for tools for handling objects with an accuracy in sub-micrometer ranges. Within the ROBOSEM project, a nanohandling robot system for a desktop SEM station will be developed, with a powerful sensory support. A modular design of the robots will allow an easy conversion of the desktop nanohandling station for different applications. For the telemanipulation mode, a haptic interface to a nanorobot will be developed and a "virtual reality" representation of the working environment investigated. To enable powerful sensor feedback, a robot sensor system consisting of video cameras and tactile-/force microsensors integrated into the manipulators will be developed. To ensure the real-time processing of sensor data, a PC-based parallel computer system will be developed. Three prototypes will be build up and evaluated: microassembly in an SEM, nanotesting in an SEM and cell handling for genomic. The main innovation of ROBOSEM Project is the first-time development of a flexible robot-based nanohandling SEM desktop station. Many station components such as on-board vision sensors, integrated tactile-/force microsensors, advanced control modules, as well as robot-based SEM techniques and tools for microassembly, nanotesting and functional and pharmaco genomics will be unique developments





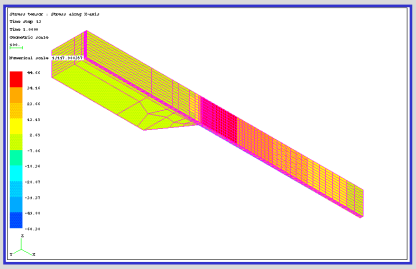
On the left – a system of nanohandling for SEM, below – biological cells handled by microgripper.

OUR ROLE IN THE PROJECT

Development of force microsensors,

RESULTS

A force sensor using a silicon piezoresistive cantilever based on constriction of an AFM probe has been studied. The main objectives of this step were:
•Specifying of ROBOSEM partners expectations and requirements concerning the force sensor.
•Computer modeling and simulation of several sensors.
•Development of concept of integration of the force sensor with a gripper.
•Analysis of the possible interferences on the force measurements.
•Designing of the technological sequence for manufacturing of the sensor.
•Designing of the layout of the sensor.
•Designing of the system for characterization of the sensor.



Simulation of the bent silicon cantilever.

On the right – a nanomotor designed and manufactured by Klocke Nanotechnik – one of the Consortium members

On the left – nanorobot platform with 6 degrees of freedom developed by Swiss partners

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