

# ims

Institute of Mechatronic Systems

# We apply Science

[www.ims.zhaw.ch](http://www.ims.zhaw.ch)



# Institute of Mechatronic Systems IMS

- Applied R&D
- R&D Services for Industry
- Education and
- Technology Transfer

40 Co-workers including:  
Lectures, scientific co-workers,  
assistants, master students,  
technical staff

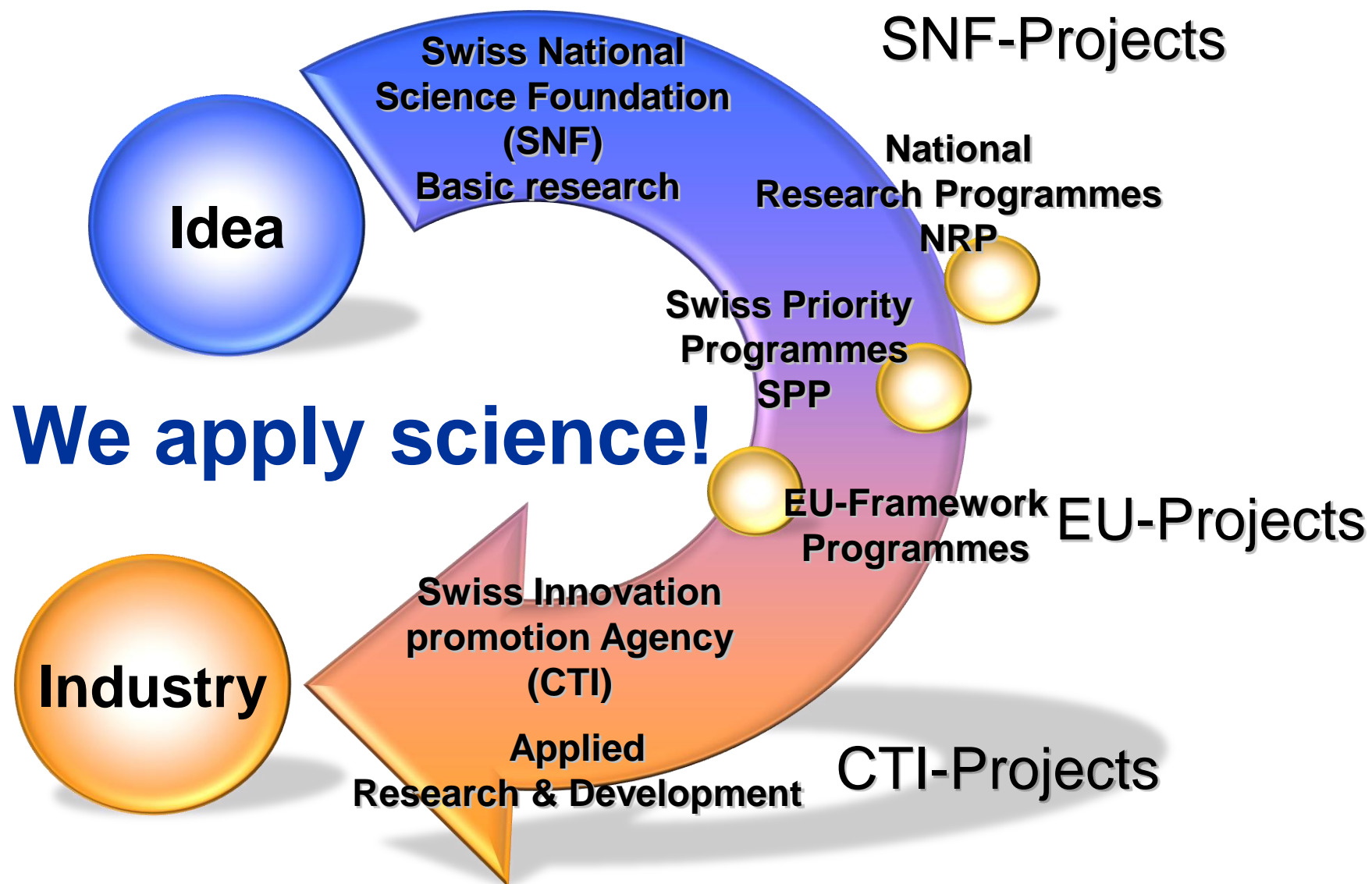
- Bachelor & Master Studies in Mechatronics and Medical Technology
- Master Research Unit MRU

**About 30 Student projects and 15 bachelor theses per year**



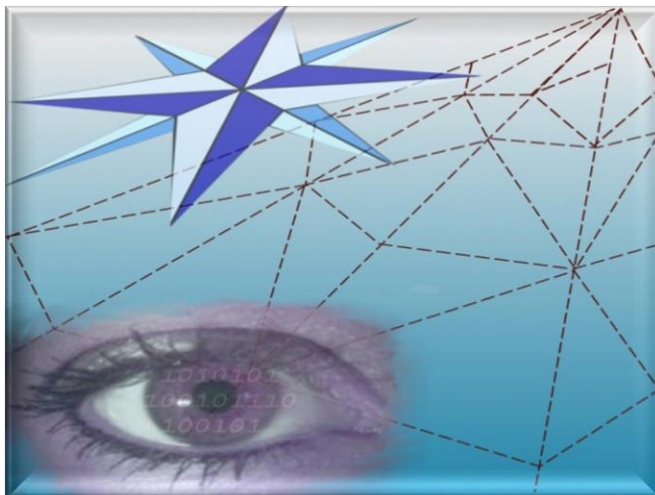
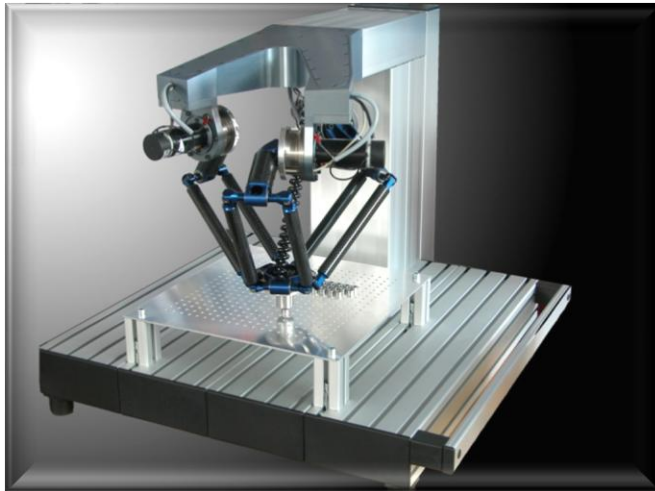
IMS-Building  
Villa Forrer

# Paving the way from basic research to real industrial solutions



# Mechatronics @ ims

## IMS key areas of applied R&D



### Robots and robot based systems

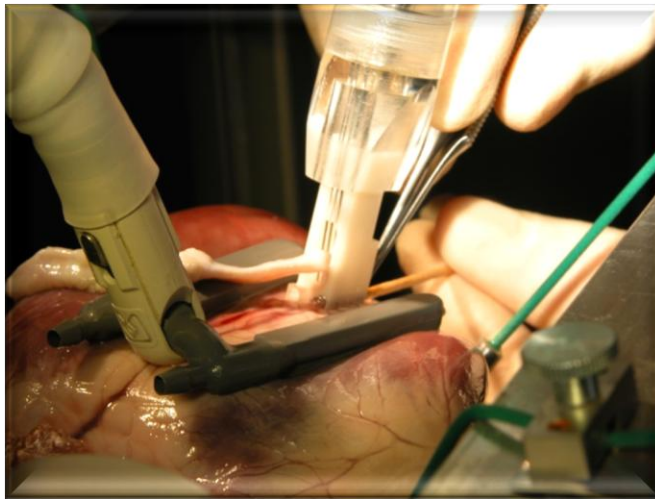
- Pick and Place and handling systems
- Robotics for manufacturing & automation
- Highly flexible self learning systems
- Service robotics
- Assistant robotics
- Autonomous systems

### Vision & Navigation

- 2D & 3D optical measurement systems
- Development of complex 2D und 3D Algorithms
- High definition feature extraction
- Ultra precise positioning and orientation
- Sensor fusion (IMU & GNSS)
- Realtime positioning & navigation

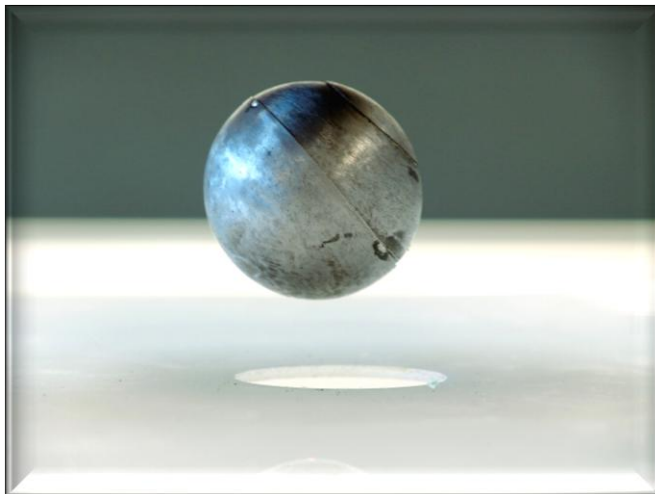
# Mechatronics @ ims

## IMS key areas of applied R&D



### Medical Systems & Instrumentation

- Minimal invasive Surgery
- Medical Micro Systems
- Medical Sensors
- Intelligent Implants
- Medical Robotics
- Rehabilitation Technology



### Control & Automation

- Control & Modelling
- Identification & Simulation
- Neural Networks & Fuzzy Control
- CNC and Motion Control Technology
- Power Electronics & Drives
- Simulation of CNC controlled Systems

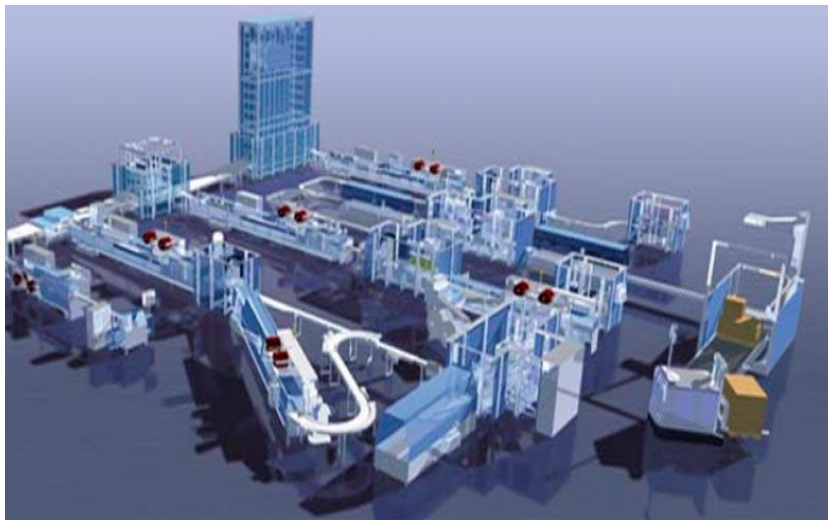
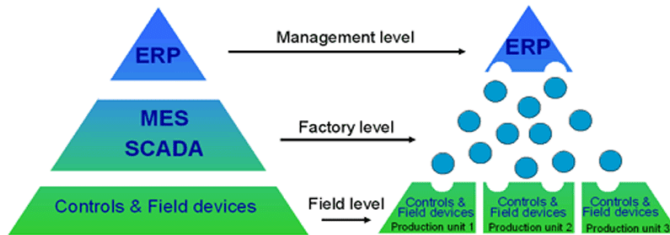
**We offer our comprehensive Experience in  
Mechatronics  
resulting from Participation in  
European and National Research Projects  
such as...**



# European FP6-Project PABADIS

## Plant Automation based on distributed Systems

**PABADIS** Plant automation  
based on distributed  
systems



PABADIS aims at displacing the inflexible plant IT infrastructure by enabling an innovative plug-and-participate environment with scalable and context driven adaptability and flexibility from the ERP-System down to single machine control.

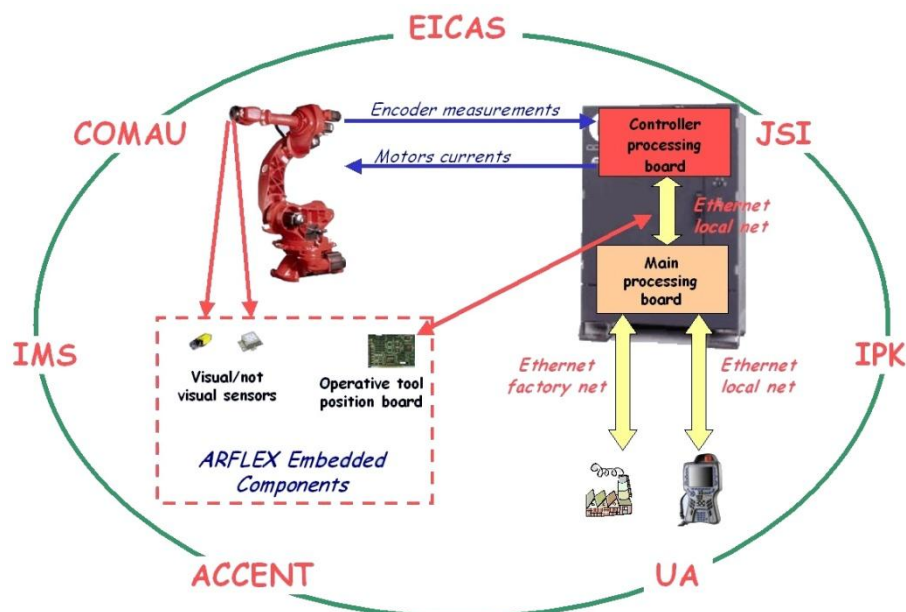
ists implemented the concept in a real robot network and tested its feasibility.



European part of project funded by  
the European Community under the  
"Information Society Technology"  
Programme (1998-2002)

# European FP6-Project ARFLEX

## Adaptive Robots for Flexible Manufacturing Systems



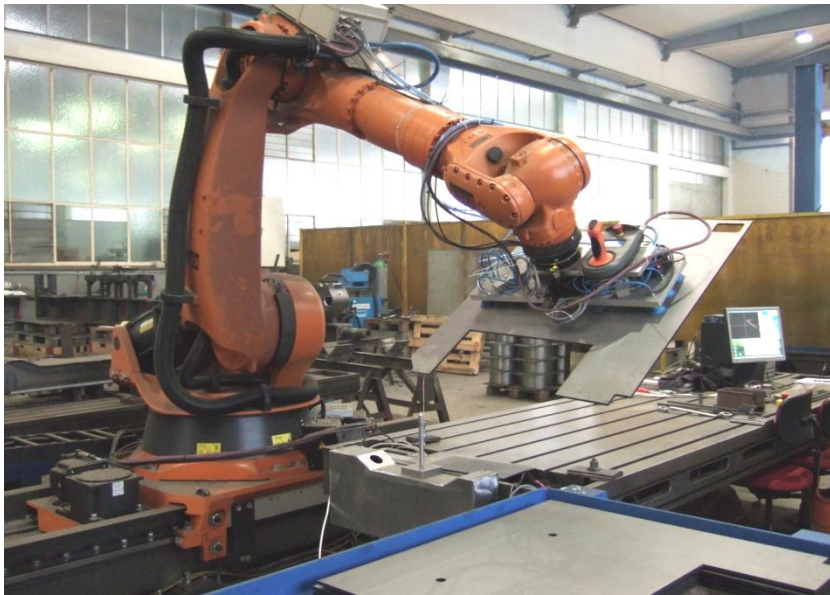
In the *ARFLEX* project *ims* contributes to the development of a flexible Robot Control Concept by investigating market needs and by applying the new robot control technology to real industrial tasks.

Project partners greatly benefit from our industrial research experiences in the fields of robot assistance systems.



# RAAS

## Robot Assisted Assembly System



Flexibility meets automation: Assistance robots are able to greatly support manual workplaces by an optimal distribution of labour: human perception, knowledge and cognitive skills are combined with strength, endurance and accuracy of machines. In welding shops with small lot sizes, such concepts lead to an increased competitiveness.

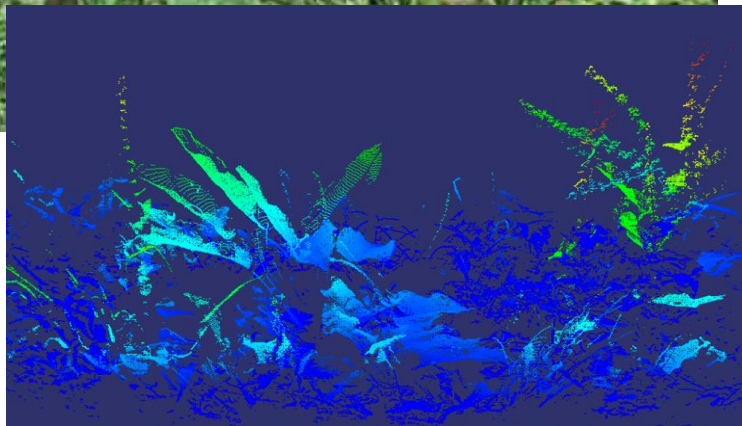
ims successfully implemented the national funded Project RAAS in a welding shop environment

**KTI/CTI**

DIE FÖRDERAGENTUR FÜR INNOVATION  
L'AGENCE POUR LA PROMOTION DE L'INNOVATION  
L'AGENZIA PER LA PROMOZIONE DELL'INNOVAZIONE  
THE INNOVATION PROMOTION AGENCY

# SmartWeeder

## Weed detection for Precision Farming



3D-recognition of weed

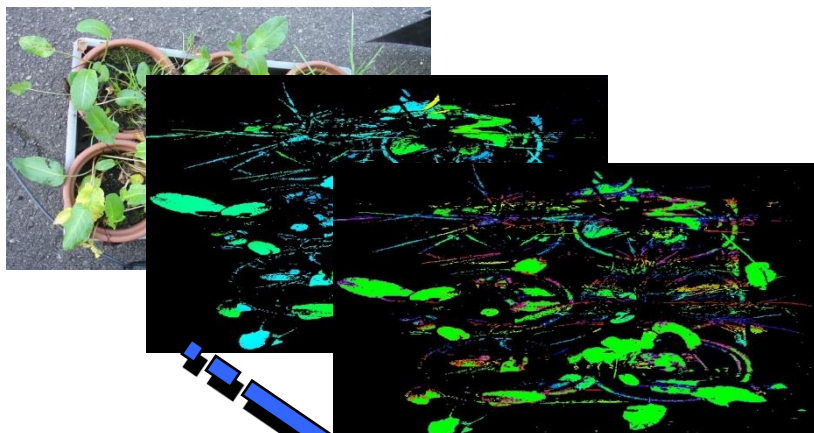
ims is currently developing a sensor guided, modular weed treatment system using 3D-object recognition systems.

The project is funded by the Swiss Science Foundation Gebert R uf and is realized together with two Swiss SMEs and the National Research Centre for agriculture Agroscope.



# Vision & Navigation

## High-Tech Solutions for Industry



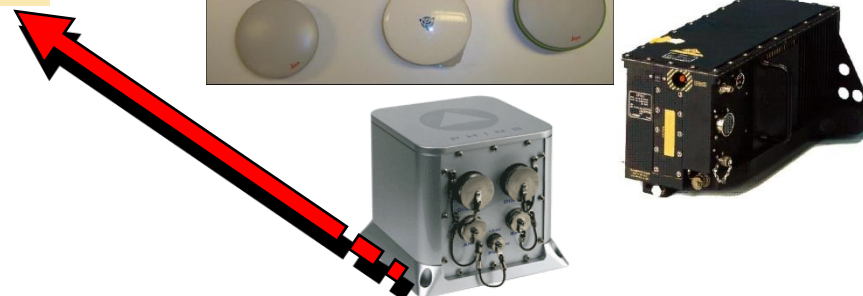
### Machine Vision

- Complex 2D and 3D algorithms
- High resolution and 3D real time feature extraction
- High accuracy position and orientation calculations for artificial and natural objects

### Positioning and Navigation

- Sensor fusion (IMU & GNSS)
- Real Time positioning and navigation of autonomous systems

**Holistic  
Mechatronic  
Solutions**



# Vision & Navigation

## Autonomous and intelligent Systems

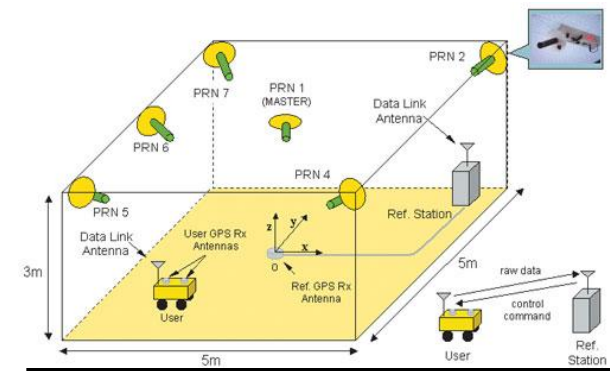
### Autonomous systems

- Outdoor navigation
- Indoor navigation
  - IMU (Inertial Measurement Unit)
  - Pseudolites (GPS signal generator on the ground)
  - Odometric methods
  - ...



### Positioning exact to the centimetre

- Advantage of GPS Networks:
  - Higher availability of data via reference network stations
  - Quality management by redundant network solution

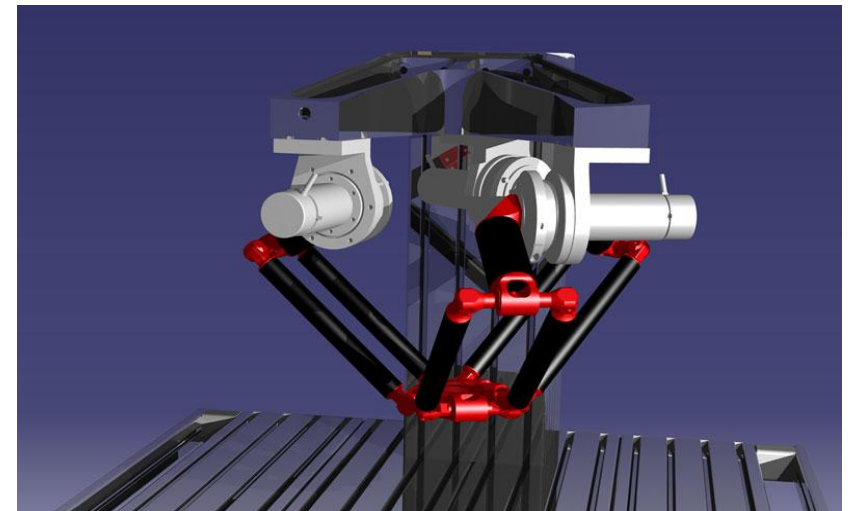
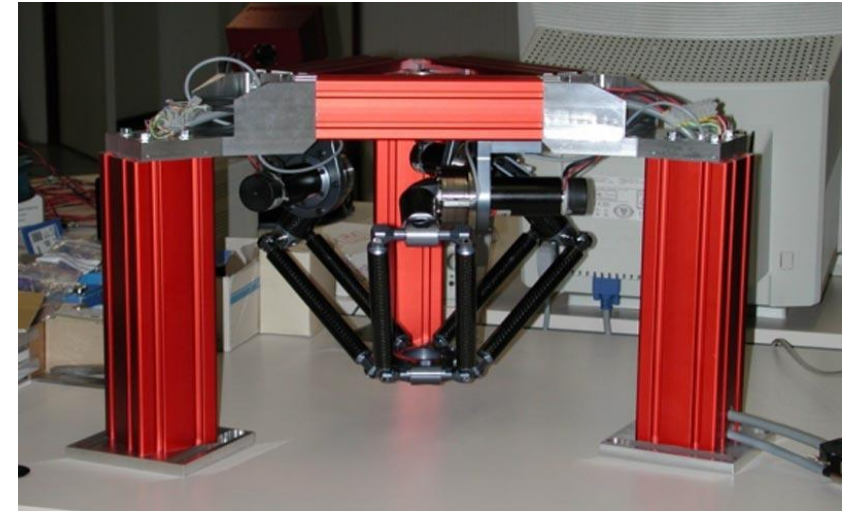


# Delta Robot

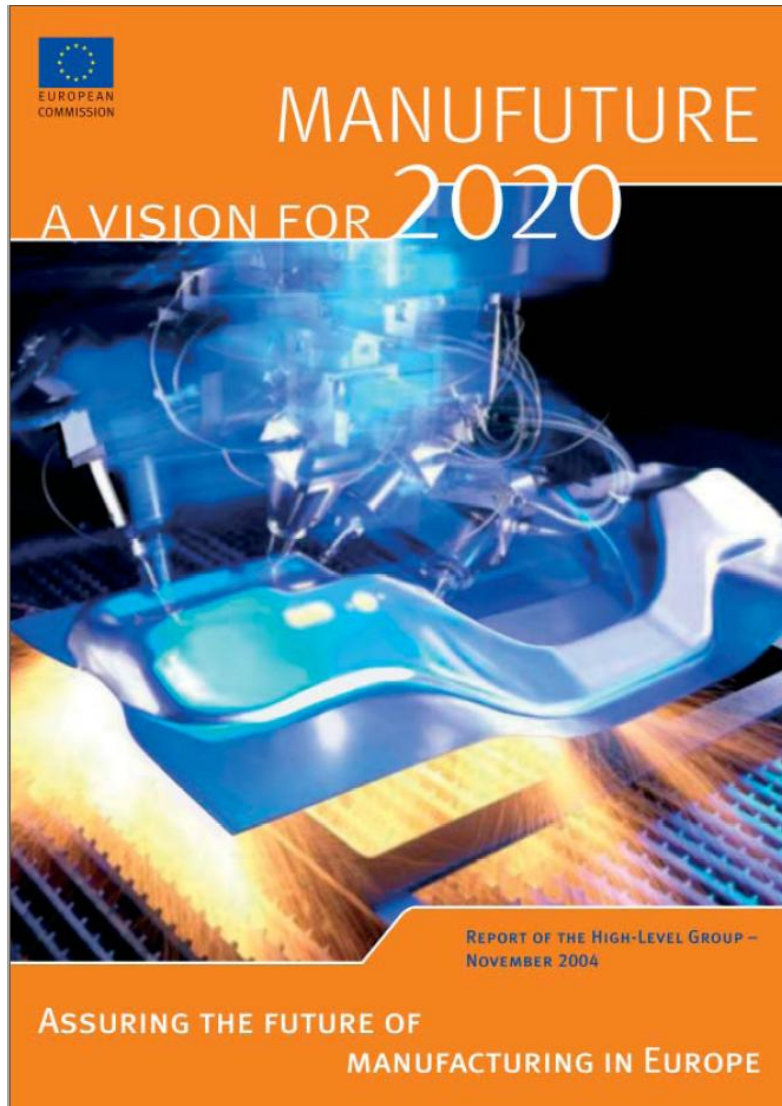
## Ultra-fast Robot-Technology for high Precision Assembly

In close cooperation with the Centre Suisse d'Electronique et de Microtechnique SA (CSEM), ims engineers developed an ultra-fast and high-precision delta robot for microassembly tasks.

- Resolution: 0.0001 mm, 1 mrad
- Position correction: 0.001 mm, 100 mrad
- Repeatability: 0.002 mm, 200 mrad
- Absolute accuracy: 0.1 mm, 10 mrad



# ManuFuture



## Mission

**ManuFuture** mission is to propose, develop and implement a strategy based on Research and Innovation, capable of speeding up the rate of industrial transformation to high-added-value products, processes and services, securing high-skills employment and winning a major share of world Manufacturing output in the future knowledge-driven economy.

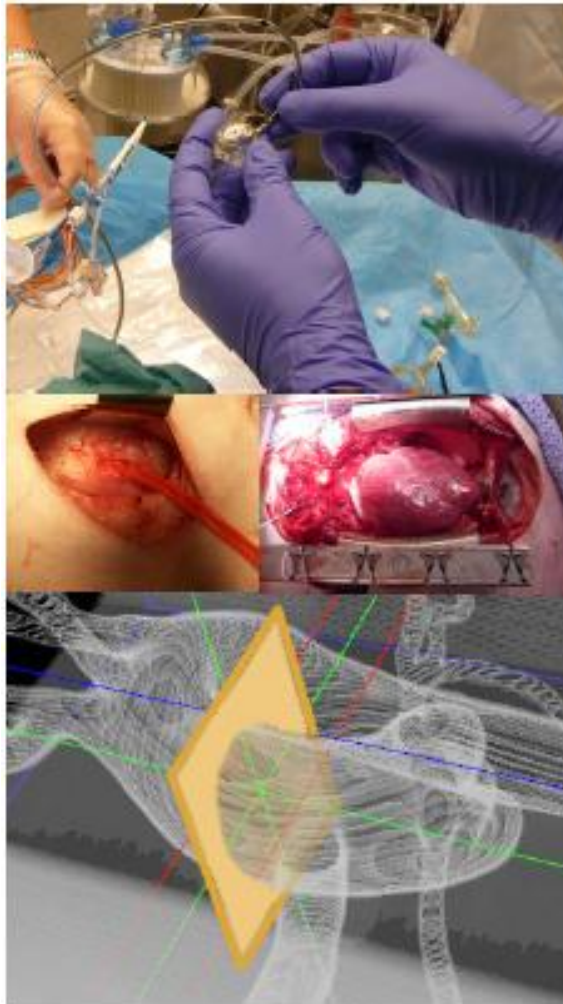
## High Level Objectives

- Competitiveness in manufacturing industries
- Leadership in manufacturing technologies
- Eco-efficient products and manufacturing
- Leadership in products and processes, as well as in cultural, ethical and social values

# European FP7-Project SCATH

## Smart CATheterization

Innovative ICT based tools for computer-aided surgical interventions.



The contribution of SCATH to improve patient safety in surgery include amongst others:

- reduced risks for patient and surgeon due to reduced or zero exposure to ionizing radiations;
- ability to develop realistic training tools for surgeon;
- less occurrence of complications during interventional procedure due to improved patient-specific pre-operative planning;
- full support to the surgeon during the procedure through monitoring and control



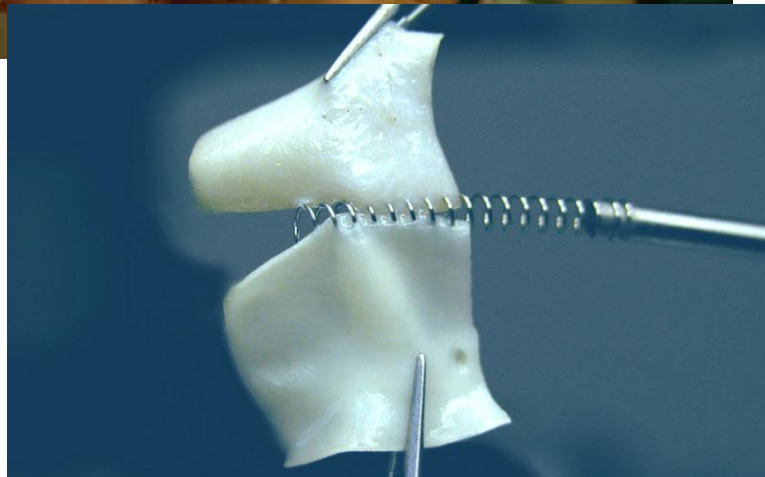
[www.scath.net](http://www.scath.net)

# National Centre of Competence in Research Robotics in Cardiovascular Surgery

## Computer Aided and Image Guided Medical Interventions



In the framework of the NCCR CO-ME programme we have developed a surgical instrument for a semi-automatic suturing process leading towards minimally invasive bypass surgery on the beating heart.



ims holds 15 patents on medical devices which have been developed in close cooperation with the University Hospital Zurich and the ETH Zurich.



# European and National Networks

Networking is essential.

ims is partner in :



EURON, European Network of Excellence in Robotics



ManuFuture, European Technology Platform (ETP)  
and Swiss ManuFuture, ManuFuture-CH



IFM, International Forum on Mechatronics



EFFRA, European Factories of the Future Research  
Association

# Some of our Premium Partners



**Please contact us**

**ims is your R&D-Partner for applying Science**

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