



## INSTITUTE OF INDUSTRIAL TECHNOLOGIES AND AUTOMATION for the competitiveness and sustainability of the manufacturing sector

### MORPHEUM PROJECT

Entirely designed and built by ITIA-CNR, **Morpheus** (Modular Reconfigurable Parallel Upgradeable Machine) is a parallel kinematics robot for **assembly** and **pick and place** operations.

Morpheus is on display at the **EMO2003, Stand B03 ITIA-CNR- Pavilion 4.I.**

In 2003, ITIA-CNR launched the **Morpheus** project for the development of an **innovative system**: machine + PC based control system + viewing system.

The main innovative features of Morpheum are its modularity and reconfigurability which permit a variation (from 2 to 6) of the machine's degrees of freedom.

Morpheus has a working space of 600x400x400 mms. Top speed is 3 m/s and the maximum linear acceleration is equal to 40 m/s<sup>2</sup>.



Morpheus is a part of the ITIA-CNR activities concerning the PKMs (Parallel Kinematic Machines) launched in 1995 with the planning and development of the first prototype called **Acrobat**. These activities were followed up with the development of **Dragon Fly<sup>2</sup>** and the **PKM 3x** used as prototypes by firms in the Zanussi group. In 2000 ITIA designed and produced **Dragon Fly** used in the Vigevano workshop for the roughing and cementing of shoe upper bottom.



At the 2002 BIMU, the ITIA-CNR presented **Celerius**: the first Italian 5-axis PKM for milling.

On the ITIA-CNR stand, besides Morpheum, visitors will have the opportunity to view **innovative tools and methodologies** for the design and development of production systems and machineries.

### ITIA-CNR

ITIA-CNR's research and activities are aimed at setting up a **National Industrial Research System**, especially for **machine tool mechanics**, which will provide the country with the *Manufacturing High-Tech* needed to ensure the competitiveness and sustainability of Italian products on the world market.

ITIA-CNR's industrial research activities cover industrial sectors that play an important role in the nation's economy (Mechanics, Design, Home Appliances, Components, New High-Tech Products) and study the whole life cycle of the products and processes in order to contribute to the competitive, credible growth of the manufacturing sector.

Below are 4 examples of pilot machines and systems designed and built by ITIA-CNR in collaboration with the firms.



**Pilot system for footwear production**  
ITIA-CNR Lab for Design & Mass Customization, Vigevano



**Pilot system for the production of wooden panels**  
ITIA-CNR Lab for Design & Woodworking, Caserta



**Pilot system for flexible assembly procedures**  
ITIA-CNR Section, Bari



**PKM Celerius**  
Designed and developed by ITIA-CNR for  
the National Programme for Research Into Innovative Production Systems

**Further information and documentation concerning ITIA-CNR's research activities and projects can be downloaded from the site [www.itia.cnr.it/news/news/htm](http://www.itia.cnr.it/news/news/htm)**

**ITIA-CNR, the National Research Council's Institute for Industrial Technologies and Automation**, plays a major role in the National and International Research system.

Through its industrial research activities, the institute works on the development of new machinery and systems and studies new organizational models with the use of emerging technologies.

Thanks to its activities, ITIA-CNR is able to promote important programmes for the training of specialists like, for example, the second **Master's in Industrial Research** course which began this year.

ITIA-CNR is a **Network Institute** comprising sections and labs spread all over the country:

- **Milano Headquarters:** carries out research and development activities concerning manufacturing equipment and the enterprise of the future.
- **Roma Section:** oriented towards the study of supply chain management models and logistics.
- **Bari Section:** dedicated to industrial development activities concerning new manufacturing equipment related, in particular, to assembly and Service Manufacturing.
- **Vigevano Lab:** houses a pilot automated and integrated system for the design and production of footwear.
- **Trento Lab:** dedicated to the development of new methodologies and tools for the design and simulation of mechanical systems and micro-systems.
- **Caserta Lab:** houses a pilot integrated system for the design and production of wooden panels.

The pilot systems in Vigevano and Bari, set up for research in collaboration with the companies, are being used for two large-scale research projects sponsored by the Institute:

- **EUROShoE**, for which ITIA-CNR, the coordinator of the project, is working on the development of new technology and processes for the application of the **Mass Customization** paradigm to the footwear sector.
- **Automotive Components Service Manufacturing**, coordinated by COMAU SpA, for which ITIA is working on the development of new solutions and technology that will permit the implementation of the **Service Manufacturing** industrial paradigm.