Manufacturing in FP7 Conference
17-19 January 2007, Cardiff University, UK

Project Proposal within FP7 Cooperation Work Programme

Theme 3 - Information and Communication Technologies

Challenge 2: Cognitive Systems, Interaction, Robotics

Area: Robots, sensor networks and other artificial systems, monitoring and controlling material and informational processes

Project Idea: Integration of Process Monitoring and Machine Tool Manitenance

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- **Proposing organisation: Dept. of Materials and Production Engineering, University of Naples Federico II, Italy**
- **Main research interests**:
  - Machine tools, manufacturing processes and simulation
  - 2D and 3D metrology systems
  - Product modelling and reverse engineering
  - Advanced nondestructive evaluation
  - Intelligent sensor development and application
  - Cognitive systems for manufacturing engineering
- **EC project expertise**: Coordination / Participation in more than 30 EC-funded projects to date, e.g.
  - EC FP6 NoE on Innovative Production Machines and Systems (I*PROMS) (Participant)
  - EC FP6 NoE on Multi-Material Micro Manufacture (4M) (Participant)
  - EC FP6 IST STREP on Intelligent Robot Swarm for Attendance, Recognition, Cleaning and Delivery (IWARD) (Participant)
  - EC FP6 Asia IT&C Project on Intelligent Computation in Manufacturing Systems (ICAMS) (Coordinator)
  - EC FP6 Tempus Meda JEP on Development of Academic Curricula in Advanced Manufacturing Engineering (ACME) (Coordinator)

Need for the project

- The increase of complexity in the manufacturing environment calls for artificial systems (robots, devices, machines) that can operate autonomously under uncertain and changing service conditions
- In this context:
  - artificial cognitive systems
  - advanced sensor technologies
  - intelligent robots

  can realize a significant breakthrough for the manufacturing industry in Europe
- Research efforts in these directions can:
  - improve the understanding of the mechanisms of artificial learning, reasoning, decision-making, communication and cooperation
  - enable the realization of machines that can understand, learn, decide and communicate with high robustness and flexibility

Project idea: Integration of Process Monitoring and Machine Tool Maintenance

Proposed application field

- Development of sensor network system for machine tool and manufacturing process monitoring
- Development of intelligent robots for machine tool maintenance
- System integration of machine tool and process monitoring sensor network with maintenance intelligent robots

Structuring of the research

- Improving system learning and cognitive capacities (e.g. through self-learning approaches and machine learning paradigms)
- Developing interactive support systems (e.g. through agent-based approaches)
- Developing experimental scenarios and/or resources for experimentation (e.g. realization of robotic systems and sensor network systems)
- Developing dedicated performance metrics and definitions of autonomy levels for the implemented AS

Target: Realization of an artificial system (AS) integrating sensors network and intelligent robots

- Goals of the AS:
  - The AS must achieve its scopes in an unsupervised way, operate also under uncertain conditions, adapt to changing service and performance requirements
  - The AS must operate in real-time and provide for modularity, scalability, flexibility, robustness and safety
  - The AS must be able to communicate and cooperate with humans and/or intelligent machines in the manufacturing environment
  - The above requirements will be achieved through the use of:
    - Advanced sensors techniques (e.g ensor integration; sensor fusion; novel sensor system architectures; etc.)
    - Innovative information processing paradigms (e.g. soft computing; combination of statistical, knowledge-based and cognitive approaches)
  - The realisation of the AS will result in a demonstrator

Project budget: **4 MEuro**

Project duration: **36 months**

Number of partners: **10 partners max**

Partners interested in the present initiative

- University of Naples Federico II, Italy (proposer)
- Cardiff University, UK
- University of Patras, Greece
- Fraunhofer IPA Institute of Manufacturing, Germany
- Schneider Electric GmbH, Germany
- Avio Group SpA, Italy
- **Additional expertise appreciated:**
  - Sensor systems provider
  - Robot systems provider

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