The European Robot Initiative for Strengthening the Competitiveness of SMEs in Manufacturing

Summary and outlook of technologies & components of the SMErobot™ initiative

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Barriers for SME automation

Barriers preventing profitable use of robots in SMEs:
1. Task operations not expressed in end-user terms
2. Teaching a robot requires programming competence
3. Expensive mechanics and drive trains
4. CAD data not suitable for SME usage
5. Motion control & workspace sensing not dependable/affordable
6. Workcell components not easy to integrate
7. Knowledge-based system hard to maintain/manage
The SMErobot Initiative

Innovations:
1. The robot capable of understanding human-like instructions
2. The safe and productive human-aware space-sharing robot
3. The three-day-deployable integrated robot system

Applications in SME manufacturing

Research & Development
• Training and Education
• Socio Economics
• Dissemination
• Exploitation
• Result exploitation
• Intellectual property rights
• Management

Interplay between core sciences and SME needs, by integration project SMErobot…
Innovations

1. **Robot capable of understanding human-like instructions**
   - **Industrial HRI**
   - → **Declarative knowledge**

2. **Safe and productive human-aware space-sharing robot**
   - **High-performance robotics**
   - → **Human awareness**

3. **Three-day-deployable integrated robot system**
   - **Modularity & Geometry**
   - → **Agile technology upgrading**
Robotics research perspective

R&D in Robotics

New Technology

Present Robot Product Development

Future Robot Product Development

Present Robot Applications

Future Robot Applications

Industry Segments
Some Technological Challenges

- **Variable access and transfer of knowledge** to generate robot programs: from CAD, databases, intuitive worker instructions, ..., inclusion of learning
- **New low-cost components**: light-weight low-inertia actuation devices, new physical structures with embedded sensing and circuits (e.g. for safety)
- **Automation middleware** to seamlessly connect robots, peripheral devices and industrial IT systems (“plug-and-produce”)
- **Process-centric workcell services** for more shop-floor suitable configuration, interaction and operation (hiding software issues behind easy-to-use tools).
Some Challenges

• Robots as **simple-to-use, low-cost solutions** for short series productions

• **Robotics is the science of integration**: Basic technologies, components, processes, industrial engineering and socio-economic factors

• Exemplary **demonstrations** and trial installations

• **Evaluation and assessment** with stakeholders for acceptance and establishing supply chain

• **Standardization and harmonization** for safety, component exchangeability, cost reduction, usability, and benchmarking
Conclusions

• Force control and lead-though programming established for usage in actual products:
  – Worked (for ideal cases) in labs 20 years ago,
  – was difficult to fit into industrial systems,
  – SMErobot enhancements and proof of concept in SMEs!

• Wide variety of competences needed for S&T progress; SME business models needed for impact!

• Very successful barrier breakthroughs (S&T results), but industrial impact not completed!

• SMErobot as a model and inspiration for extended Robotics and Automation research....