Autonomous Mobile Robots in Diverse Work Settings

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# Different styles of mobile robots

<table>
<thead>
<tr>
<th>Robot</th>
<th>non</th>
<th>Sensitive</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform</td>
<td>1500kg</td>
<td>200kg – 100t</td>
<td>1500kg</td>
</tr>
<tr>
<td>Controller</td>
<td>one</td>
<td>200kg</td>
<td>3-100t</td>
</tr>
<tr>
<td>Drive</td>
<td>differential</td>
<td>omnidirectional</td>
<td>one</td>
</tr>
<tr>
<td>Navigation</td>
<td>Autonomous (laser scanner-based)</td>
<td>two</td>
<td></td>
</tr>
</tbody>
</table>
High flexibility

Omnidirectional wheels and autonomous navigation
Autonomous mobile robots for different work settings

- Manufacturing
- Material supply
- Product transport
- Lab automation

- Manufacturing
- Material supply
- Machine tending
- Machine feeding
Application:
• Transportation of truck cabins through welding cells

Motivation:
• Increase cycle time
• Flexible drive options
• Replacement of AGVs

Additional information:
• Safety in cell through “muting”
Muting principle to enter work cells

- Temporary bypassing of the protective action of a safety device
- Mobile robot can be permitted to pass without the need to interrupt a work process
- Additional sensor signals make it possible to distinguish between objects and persons
Material supply

Application:
• Autonomous transport of material through the production process

Motivation:
• Automate manual process

Additional information:
• Additional sensors added for application safety
Conveyor docking sensor example
Material supply

Application:
• Autonomous rack transport

Motivation:
• Implementation of new technologies
• Space saving (main idea was rotary tables)
• Flexibility

Additional information:
• Using live data to run process and optimize cycle time
Material supply

To tugger train
(brings full racks and moves away empty racks)

Storage
positions

2 mobile robots

To production (unloading)
Planning for fast-changing processes

Task:
“Move the empty box from A1 towards the pre-position D2 for tugger train!”

Question to Production Planner:
“Based on actual production context*, is there a string of operations in order to solve the task?”

Statement Production Planner:
“On AGV1’s way, C2 is blocked by a box; however, AGV1 is still blocked by an ongoing process, and at the predicted time of passing C2, the place will already be emptied by AGV2.”

*cycle time, order sequence, AGVs, amount of parts, Battery level, rack types, etc.
Product transport

**Application:**
- Autonomous transport of material through the production process with manual loading

**Motivation:**
- Implementation of new technologies
- Automate manual process
Lab automation

Application:
• Different work stations make molecules

Motivation:
• Implementation of new technologies
• Automation of a complex process
• Increase productivity

Additional information:
• Robot sensitivity used for safety and process
Manufacturing

Application:
• Fastening in automotive assembly

Motivation:
• Implementation of new technologies
• Automation of a manual process
• Support the employee

Additional information:
• Robot sensitivity used for safety and process
Material supply

Application:
• Loading/Unloading of wafer boxes

Motivation:
• Implementation of new technologies
• Automation of a manual process
• Increase productivity

Additional information:
• Robot sensitivity used for safety and process in clean room environment
Machine tending

Application:
• Automated chaining of CNC machines and quality station

Motivation:
• Flexible automation with different process
• Autonomous handling of tools

Additional information:
• Robot sensitivity used for process
Machine feeding

Application:
• Automated change of packing rolls

Motivation:
• Implementation of new technologies
• Automation of a manual process
• Support the employee

Additional information:
• Robot sensitivity used for safety and process
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