AI enabled task allocation for smart logistics operations using flexible mobile robots

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Dynamic reconfigurable shopfloors

“Enabling mobility on products and resources”

Mobile Product Platform (MPP)

“Human-Robot & Robot-Robot collaboration in a safe way”

Mobile Robot Platform (MRP)

Environment Perception

“Dynamic balancing and redirecting to stations”

Product & Process Perception

“Perception & skills to automatically program and execute multiple tasks”

Link to YouTube Video
Mobile Robot Platform (MRP)

- **Autonomous navigation** across the shopfloor in a safe way
- **Perform a variety of tasks** using on-board tooling
- **Dual arm manipulation** enhancing dexterity
- Collaborate with humans **acting as assistant** to them
- Collaborate with **other mobile resources** through share perception

![Image of Mobile Robot Platform (MRP) with THOMAS logo]

- UR 10 Arm (6 DOF)
- Pan-Tilt Camera
- UR 10 Arm (6 DOF)
- Torso (2 DOF)
- Mobile Platform (Omnidirectional)
Challenges

Mobile dual arm workers acting as assistants to humans are in the forefront of research agenda for industrial applications in EU manufacturing

• Existing challenges
  – Safety issues for removing fences
  – Accuracy in navigation / localization
  – Easy programming techniques
  – Intuitive interaction mechanisms
  – Monitoring and control of execution
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Existing challenges:

- Safety issues
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- Easy programming techniques
- Intuitive interaction mechanisms
- Monitoring and control of HRC execution

Thus, in this topic the focus is on HOW:

✓ To model this dynamically changing environment
✓ To distribute the task to the available resources
✓ To ensure collision free paths and arm motions
How to model and (re)-distribute the tasks to the resources?

- Hierarchical modelling of the shopfloor / process
- Resources suitability assessment
- Intelligent – search based – multi - criteria decision making
- Digital world model based dynamic robot programming
- Alternative scenarios assessment based on real time shopfloor data
How to enable collision free robot behaviour?
Outcome and Conclusions
Acknowledgements

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Thank you for your attention!

Questions?

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