Workplace Optimisation Service
T4.3 & T5.3

Homo et Machina: La simbiosi nell Industria 4.0
LMS. Who we are

- LMS is involved in a *number of research projects* funded by the CEU and European industrial partners. Particular emphasis is given to the *co-operation with the European industry as well as with a number of "hi-tech" firms*

- LMS is organized in *three different scientific groups*:
  - Manufacturing Processes Modelling and Energy Efficiency
  - Robots, Automation and Virtual Reality in Manufacturing
  - Manufacturing Systems
LMS. Indicative RTD Collaborations
HUMAN. Concept

HUMAN aims at developing a platform that is contextually aware of both the factory and the human operator, identifying when an intervention is required in order to support the operator in performing their tasks with the desired quality, whilst ensuring their well-being. The preliminary analysis of needs yielded to five so called services, divided into two categories: Short Term Services and Long Term Services.

Exoskeleton Service

KIT Service

WOS

SKN

SII
WOS. A long term service

**HUMAN** can trigger interventions to help human operator based in his status, but what if the system detects...

... frequently that operators are very tired in a specific area?

... a large percentage of sick leaves associated with a specific task?

... frequently that operators are confused when executing a task and request instructions?

... ...

Short term interventions are not addressing the problem → a long term intervention is needed to **improve the workplace!**
WOS. Immersive virtual shop floor environment

- **Immersive VE** based on the COMAU shop floor - Allows the visualization of shop floor and **simulation** of mfg tasks
- **Interactions** modelling - Enables humans to accurately manipulate scene objects using different grasp types.
- → Serve as a baseline for assessments
WOS. Enhanced Spaghetti Diagram

- Simple but efficient lean tool for optimizing handling of materials and movement of workers.

  *Up until now performed by following operator around, using pen and paper!*

- Automatic generation of the Spaghetti Diagram (tracking of the user’s movements)

- Heatmap feature to extract time information and detect bottlenecks & time waste
WOS. Real-time Ergonomics Assessment

Rapid Upper Limb Assessment - online scoring

- Sensors track operator’s body - joint data
- Real time estimation of score for the current posture
- 1 x Kinect for Windows v2

Action level 1
A score of 1 or 2 indicates that posture is acceptable if it is not maintained or repeated for long periods.

Action level 2
A score of 3 or 4 indicates that further investigation is needed and changes may be required.

Action level 3
A score of 5 or 6 indicates that investigation and changes are required soon.

Action level 4
A score of 7+ indicates that investigation and changes are required immediately.
Workplace Optimization Service (WOS)

WOS. Visibility – Reachability – Golden Zone

Visibility Assessment
• Near and mid peripheral view
• Highlight visible elements in the immersive environment and the Engineer UI

Reachability Assessment
• 50th percentile of American males
• Highlight grabbable elements in the immersive environment and the Engineer UI

Golden Zone
• To eliminate waste all activities have to remain inside the GZ
• Highlight GZ in the immersive environment and the Engineer UI
WOS. Layout Redesign

- Pop up information notifications of layout elements
- Information retrieved by the HUMAN system
- Real time estimation of the impact of the rearrangement workplace
- Use of A* path finding algorithm for distance estimation

- Modification of the layout from the immersive environment
- Shadow casting when moving a 3D element
WOS. Relevant Papers


Thank you!

For more information visit us at http://www.humanmanufacturing.eu/