

Workshop on Product Intelligence (Institutional presentation)

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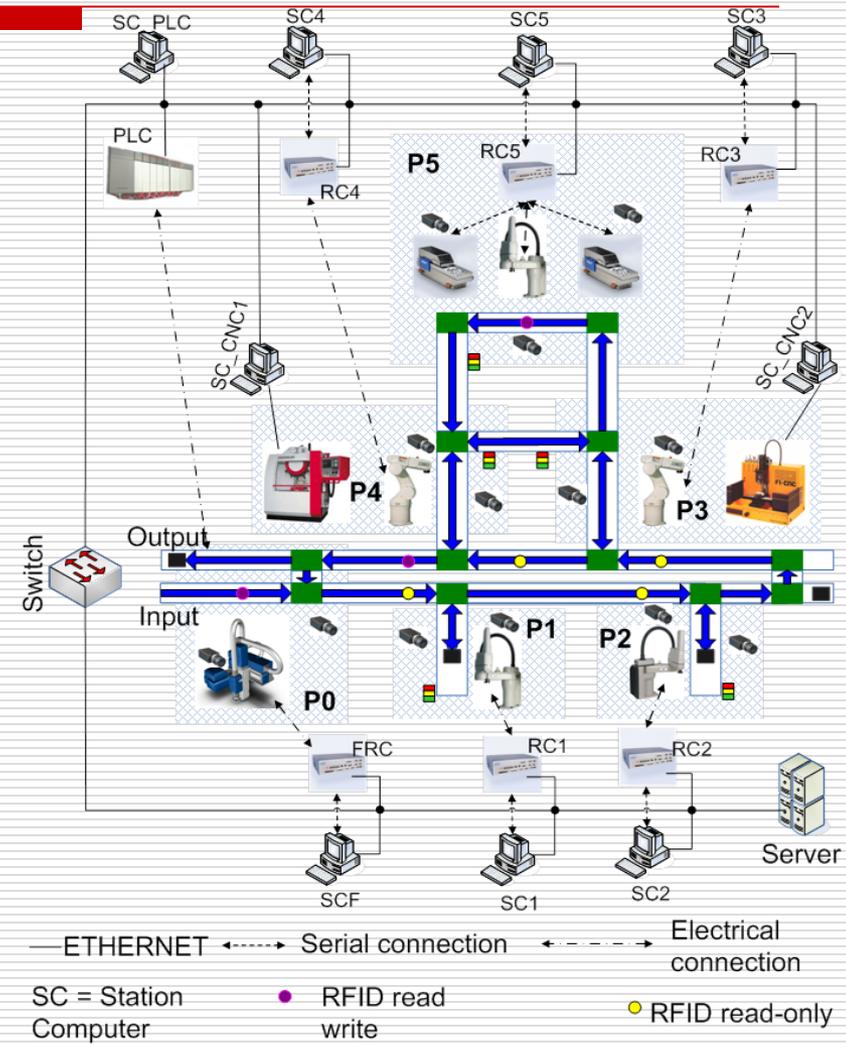
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Agent orientation of manufacturing control, research on IP

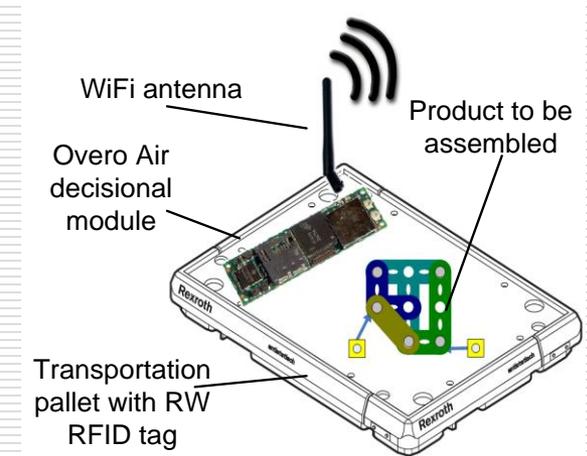
Distributed Intelligence for FMCell control

- *Shop-floor* manufacturing structure
- *4-robot workstations* (2 SCARA, 2 vertical articulated for assembly)
- *2 CNC milling machines* tended by vertical articulated robots
- *1 Cartesian robot workstation for pallet I/O & geometry control of products* [CARTERV]
- *1 SCARA robot workstation with dual part feeding devices* (vision-based AnyFeeders)
- *Common workspace* shared by the 2 SCARA workstation robots
- *Dual video cameras* (stationary, down looking / mobile, arm mounted) for each machine vision system connected to robots in P0-P5

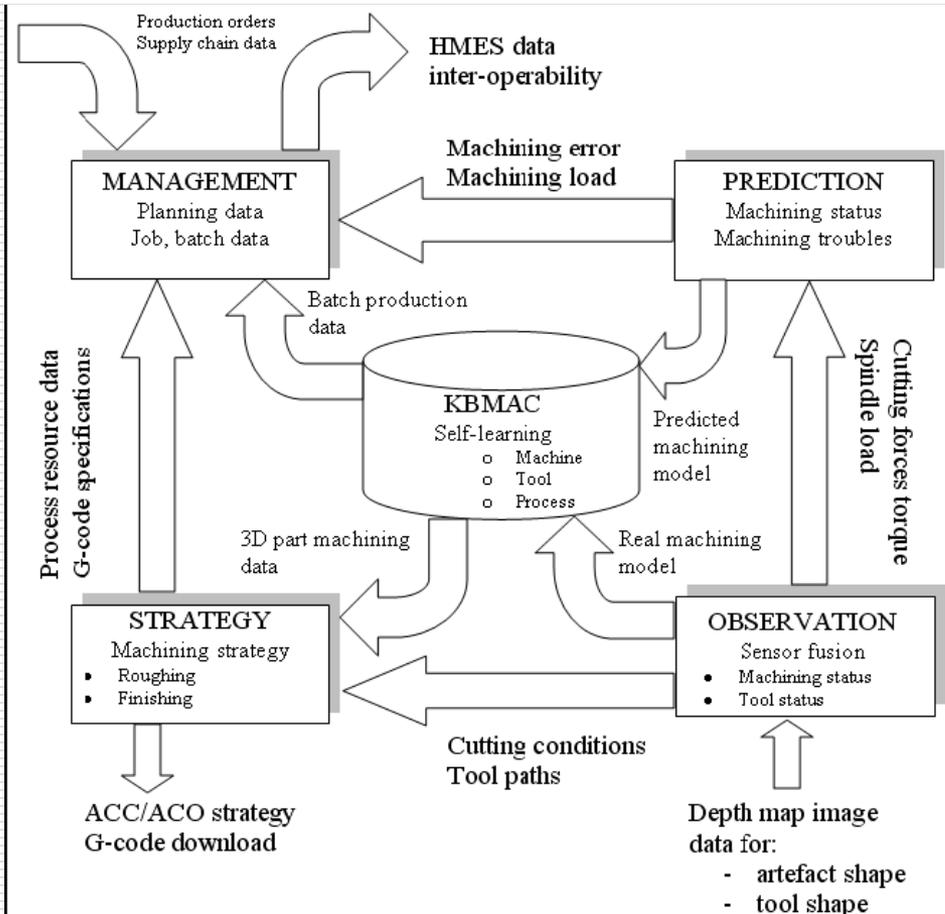


Agent orientation of manufacturing control, research on IP

- **Objectives: FMS control (best performance and predictable over time)**
- **Solution:**
 - **Control structure** that has the advantages of central or hierarchical architectures (Ex.: Off-line schedule generated by a central entity)
 - Problem: **perturbations (e.g.: stock depletion, rush orders, etc)** that invalidate the central planning and scheduling
 - **Holonic control** (autonomous and cooperative entities)
 - **Resource driven automation** → Product driven automation
 - **Intelligent products** (Meyer et al., 2008) in a service oriented control architecture

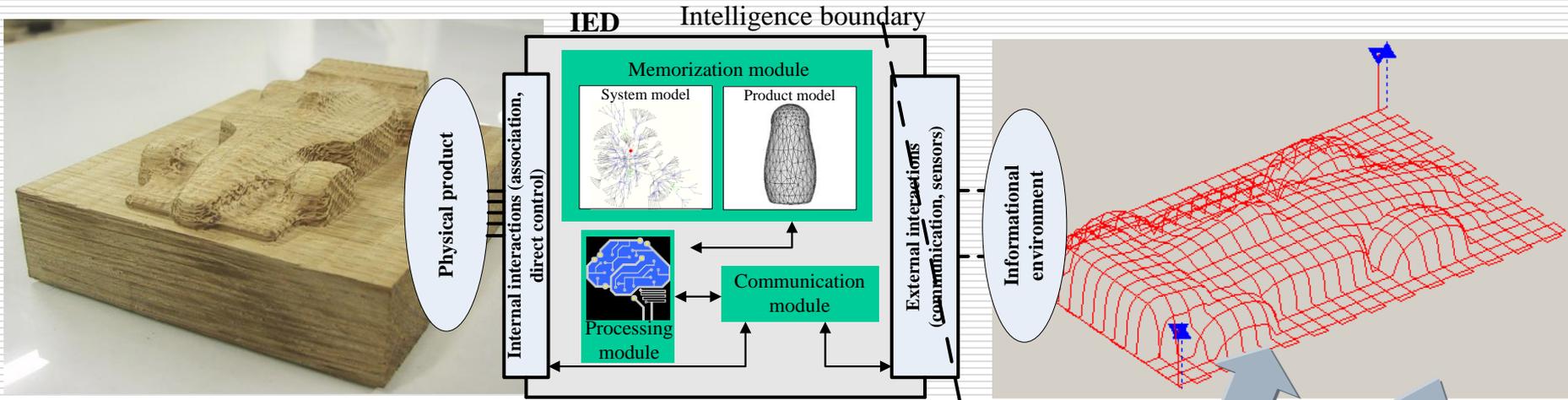


KB Adaptive Machining, research on IP



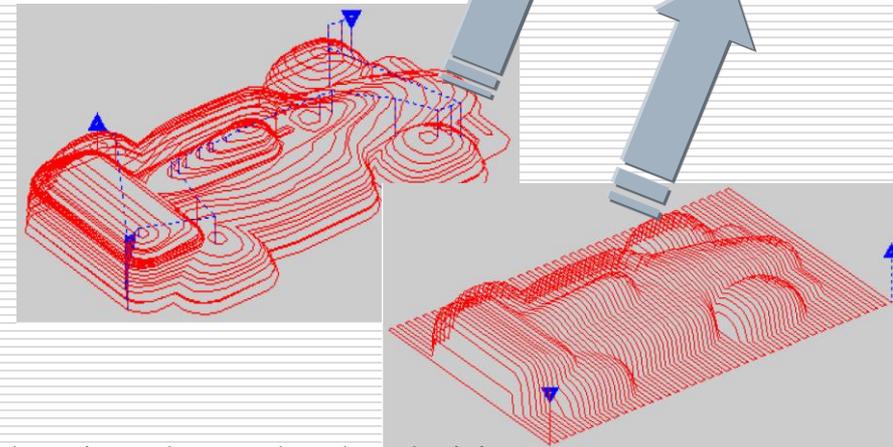
- KBAMC (knowledge-based adaptive machining concept)** → A framework for effective, reliable and sustainable [even for small batches] manufacturing, based on IP:
- physical artifact model → digital model
 - *exact representation* (at pixel level)
 - the *recipe* (embedded machining technology)
 - tool path generation from depth map images
 - *tooling*: tool compensation from image processing
 - *configurable machining strategy* (roughing / finishing; XY plane / constant Z / combined)
 - simplifies *machine set up*
 - embeds *geometry inspection descriptors*: local / global

KB Adaptive Machining, research on IP



Location of IP:

- *through network* (outside the physical product) or
 - *at object* (on the IED) – **embeds**:
 - ✓ O_Holon: production order
- stores:**
- ✓ product data (strategy, tool path, tool compensation)
 - ✓ resource data (machine requirements, set up)



Decision-oriented IP: unique ID; comm. RH / RSAM; stores data; is understood; takes decisions