An Agent-Based Approach for Automating The Disturbance Handling for Flexible Manufacturing Systems

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Dynamic Environment of Flexible Manufacturing Systems

Disturbances:
- occur frequently and from different sources
- are handled manually ➔ reduced efficiency and stability
- Demand on automating disturbance handling

Changing requirements
- Urgent job arrival
- Job cancellation
- Due date change
- change in job priority

Central Tool Magazine

M1

M2

M3

M4

Store: (Raw Material)

Store: (Finished Product)
Challenges of Automating Manual Handling Method

1. How to monitor the large number of failure-prone sources on shop floor?
2. How to keep track of changing requirements in planned jobs?
3. How to identify jobs affected by disturbance?
4. How to decide whether an action is necessary or not?
5. Which action would lead to least impact?
6. On which resources should the selected action be applied?
7. How to identify consequences of selected action on other planned jobs?
Proposed Agent-Based Approach

Software Agent
- Self contained problem solving entity
- Predefined goals
- Autonomous goal-oriented behavior
- Integrated in environment and interacting with peer agents

Proposed Approach

Automating disturbance handling with minimal impact and reduced computational complexity

- Decentralized autonomous identification
- Hierarchical cooperative disturbance analysis
- Negotiation-based action selection
- Computed time: 0.2 second on 2.0 GHz processor
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Problem

Proposed approach

Disturbance modelling

Illustrative examples

Thank you for your attention