
FAIRWORK
Bringing human, AI, data and robots together.

Introduction

Current automated and hierarchical structured production processes can only insufficiently deal with the upcoming flexibilization. We foster the “democratization” of decision-making in production processes, hence the participation of all involved stakeholders, by introducing a decentralized AI system. Our Democratic AI-based Decision Support System (DAI-DSS) finds democratically the appropriate decision for a concrete situation during production. Each human or technical actor is represented by an agent who negotiates based on the current status provided by the digital shadow and twins. The future situation is predicted by AI algorithms for each individual actor considering the modelled knowledge base that defines each negotiation strategy. A multiple optimization algorithm finds the most appropriate solution considering the needs of all involved human and technical stakeholders.

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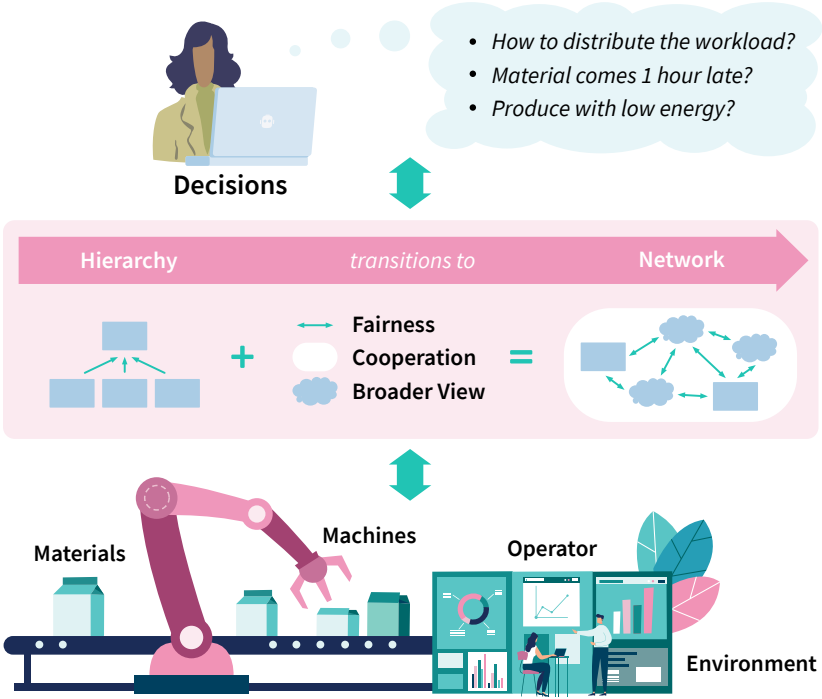
MOTIVATION



FAIRWork facilitates new gains

- Raise flexibility of complex system
- Enable cooperative optimization
- Strengthen trust and fairness in system
- Strengthen energy efficiency

FAIRWork reduces pains

- Reduce dependencies
- Reduce uncertainty in decisions
- Reduce unforeseen situations
- Reduce decision stress

Insights

Design Decision Models and Decentralization

FAIRWork brings “Human, AI, Data and Robots” together, by introducing following measures

(a) Designing Decision Models and assessing if those models are “appropriate / fair”.

(b) Decentralizing the decision-making, by representing each involved – human or technical – actor within a Multi Agent System and configure each agent with previously approved decision models.

(c) Broadening the view to optimize the production process, by also introducing social and energy related parameters to the existing technical and business related aspects. These will be identified and valuated in a participatory and user-centred design process. This enables a more balanced decision-making in complex situations, as the flexibility opens-up “space for manoeuvre”.

AI Decisions and Cooperative Networks

We want to transform the decision making of current production processes towards a cooperative decision-making, by

(a) introducing concepts that make human workers trust the decision making independently of whether the decision is performed by a human, by an AI, or in a hybrid manner,

(b) enabling cooperative decision-making to capture the real world situation in a more complete and holistic way and

(c) introducing more influence factors to transform the current automated and hierarchical system towards cooperative networks with individual responsibilities and competences.

The production process is the central knowledge platform and starting point, when analysing which – conflicting or relevant – "decisions" need to be taken, by whom, with which information and for which goal. We support human decision makers in making decisions (a) under uncertainty, (b) strong dependencies on unknown future events, (c) affecting human and machines work balance, (d) affecting the overall success of the production process, (e) using with "best effort" the available data in (f) often a very complex and conflicting situation. The decision with influence factors is represented in the cloud of the figure in the right.

Fig. 1. Risk assessment.

IDEA

Process & Decision Models

Quality *Workforce Safety* *Time* *Machinery Lifespan*

Cost *Energy / CO2 Consumption*

Workforce Satisfaction *Waste*

Expert Knowledge

Democratic AI-Based Decision Support

Methods & Guidelines *for Trustworthiness*

Configuration

+

Orchestration

Bringing **human, AI, data, robot** *together in a* **manageable way**

+

AI Enrichment

AI & Knowledge Processing

Experimentation Laboratories

Knowledge Base

Personal Needs

Vehicle Conditions

Robot Capabilities

Line Configuration

Data Lake & Data Fusion

Conclusion

The assumption is that decision relevant information is currently in digital shadows and twins, or can be represented in digital shadows and twins. Our idea is to digitally describe all relevant stakeholders as digital twins, and define an agent for each digital representation that continuously negotiate with all other agents to find cooperative decisions. Each agent aims to optimize all decisions for each individual actor by simultaneously contributing to the overall optimization of the production process.

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