Dynamic SALSA (Dynamic Scheduling of Assembly and Logistics Systems using AI)

Abstract:

Dynamic SALSA develops AI solutions and practical software applications for dynamic scheduling technologies in smart assembly and logistics for the automotive sector. It involves OEMs, SMEs and universities from Sweden and the Republic of Korea. It establishes a unified framework and interoperable platform, and shop floor applications for end-to-end engineering in smart manufacturing including AI, digital twins, Industrial Internet of Things, and vision-based system for data gathering. We contribute to enhancing economic, environmental and social sustainability.

Countries involved

Application sectors
Automotive sector

Research and innovation domains
Intelligent and Adaptive Manufacturing Systems
Digital, Virtual, and Efficient Companies
Person-Machine Collaboration

Total cost in M€ (millions)
1.869 M€

Starting date
01/04/2023

Duration (in months)
36 months

Project website
https://www.kth.se/hpu/research/current-projects/dynamic-salsa-1.1223593

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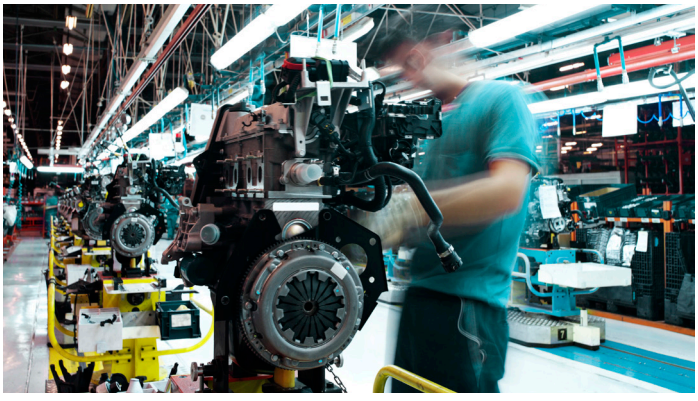
RATIONALE OF THE PROJECT

Today the automotive sector faces critical challenges jeopardizing its competitiveness. IT requires a coordinated and dynamic response from diverse sites across its supply chain for producing, transporting, storing, and assembling sub-components leading to a final product. Increasingly, the automotive sector regards Information and Communication Technologies (ICT) as key success factors facilitating ubiquitous connectivity, end-to-end visibility, data management, information and knowledge sharing and AI-based decision-making

The automotive sector must meet three needs dynamically to retain its competitive advantage. First, increased customization on a global scale. Second, increased awareness about sustainability in manufacturing including environmental aspects (e.g., global drive for carbon neutral manufacturing systems) and social ones (well-being of staff in manufacturing systems with increasing levels of automation). Third, the automotive sector is increasing the level of automation in material handling and assembly operations for enhancing operational performance.

Despite recent advances there is a need for investigating ICTs, Artificial Intelligence (AI) together with Digital Twins, that support the dynamic needs of factories in brown field environments at low cost. Similarly, the experience and tacit knowledge of staff in assembly is increasingly insufficient for meeting the needs of customized products. It is essential to develop coordinated ICTs (e.g., AI vision systems or digital dashboards) supporting staff in assembly.



TECHNOLOGICAL INNOVATION, ACHIEVEMENTS AND RESULTS

The project pursues two key technological innovations to the state-of-art consisting of: 1) Vision-based systems, Digital Twins and dynamic scheduling for assembly, 2) AI algorithms for dynamic scheduling in logistics. We present our results use cases including heavy vehicle and train manufacturing industries.

The project provides two technological achievements 1) Digital Twins including simulation environment and a reinforcement learning algorithm for assembly. 2) Monitoring services based on vision systems and digital twins, and AI-based dynamic scheduling and execution of material handling.

The results of the project involve the execution and control of material handling with AMRs and Production logistics control system for dynamic scheduling in a demonstration for logistics. Also, the validation and field-testing of dynamic scheduling algorithms in a demonstration for assembly.

MARKET POTENTIAL

Digital twins and vision systems for manufacturing constitute rapidly growing markets with expected annual values of 73.5 billion and 13.23 billion USD by 2030 respectively. Similarly, AI application in manufacturing will exceed 2.0 billion USD in 2025, and autonomous services for material handling will report a value of 8.70 billion USD by 2028.

The Dynamic SALSA includes large manufacturing companies that are global leader (Scania AB) and newcomers in the automotive industry (Woojin LTD), and two SMEs (SiB solutions and Corners) and universities with specialized competence in ICTs and the use of Ai (Sungkyunkwan University, Seoul National University, and KTH).

IMPACT POTENTIAL

The project presents distinct benefits to companies. Economic benefits involve improved throughput and lead time of assembly and enhanced delivery of logistics. Environmental benefits comprehend reduced energy consumption, CO2 emissions, and waste. Social benefits consists of increased safety and reduction of cognitive load for staff.