KoDeMat – Software Platform for Collaborative Design of Decentralized Controlled Material Flow Systems in Facility Logistics

The KoDeMat research project aims to the development of an open-source, software platform for supporting the collaboration between partners at designing and testing of heterogeneous decentralized controlled systems prior to deployment. Offering a 3D visualization environment and interface design functionalities the platform enables engineering processes that support a cross-company design, deployment and testing of material flow systems.

Introduction

In order to cope with the increasing need for flexibility, today's material flow systems move towards decentralized and modular approaches. However, operation and control of the majority of such systems are based on manufacturer-specific standards, thus resulting in the loss of their reusability, and making the task of integrating two or more systems a rather complex one.

In the past decade, applied research in the field of automated material flow systems has introduced decentralized control approaches with numerous commercial applications already making their way into market. Main reason for this development is the demand for flexible, reusable systems that can adapt to the evolving requirements of today's rapidly changing facility logistics area. Such a decentralized control paradigm is referred to as “Internet of Things” (IoT) in the facility logistics and it describes a decentralized approach to inhouse material flow systems.

Project Goals

To address the challenges that arise, there is a need for Internet enabled ICT Software tools for providing collaboration services that assist to the processes of design, implementation and deployment of heterogeneous inhouse logistics systems.

The KoDeMat project focuses on designing and developing a software platform for supporting collaboration between partners, at projects in which the integration of various subsystems of decentralized controlled plants comes into play. This platform supports the efficient planning of multiple plant subsystems located at remote plants by providing software tools for supporting the real-time and offline collaboration between remote partners.

The platform is to be used from developers, planners and system integrators during the system design phase, when the various subsystems are to be configured for compatibility, and later until the run-up phase, where it can be used to test and visualize the operation of the resulted system.

Expected Results

The development of complex heterogeneous decentralized controlled systems, that are integrated using a common interface service, targets the following results (Figure 2).

- Cost and risk reduction at design, deployment and modification of material flow systems.
Research projects 17391

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Approach

During the project lifecycle, collaborative engineering approaches will be put into use to enable an effective cooperation between the partners that participate in the project. Through interviews with experts from the area of logistic facility manufacturing and automation software providers, experimental data regarding collaborative processes and best practices will be gathered. Particular focus will be given to challenges that have arisen with regard to collaboration in past projects.

Based on this data an agent-oriented cloud-based collaboration platform with a distributed interface definition module will be designed and implemented. Appropriate network protocols and communications technologies will be defined and put into use in the KoDeMat software platform. In order to enable multiple user to synchronously observe the state of a joint material flow system, a test environment with a distributed 3D Visualization module is being developed. In addition to the test environment, collaboration software tools such as code and user management tools that will be integrated to the software platform.

The platform’s functionality, will be tested and demonstrated through a reference scenario in which two agent-based controlled material handling pilot plants located in the test facilities of the participating institutes (fml – FLW) will be connected and merged in a virtual joint system. (Figure 2).

Projektpartner

The KoDeMat research project is being carried out in cooperation with the following research institutes and companies:

- Lehrstuhl für Förder- und Lagerwesen
  TU Dortmund, Prof. Dr. M. ten Hompel
- Artschwager und Kohl Software GmbH
- CIM GmbH
- Lanfer Systemhaus Automation & Information GmbH & Co. KG
- LinogistiX GmbH
- viastore systems GmbH
- Siemens AG Corporate Technology
- Dematic GmbH

Ansprechpartner

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Figure 1: Software Collaboration Platform

- Guarantying the logistics functionality of the joint system, irrespective of the control concepts applied in the subsystem-layer
- Efficient cooperation of small and medium-sized companies
- Easier entrance to new markets for SME

Figure 2: Virtual Joint System