Digital Technologies, Advanced Robotics and increased Cyber-security for Agile Production in Future European Manufacturing Ecosystems

Results

Project Information

TRINITY

Grant agreement ID: 825196

Funded under H2020-EU.2.1.1.

Overall budget € 16 335 948,75

EU contribution € 15 997 267,25

DOI 10.3030/825196

Start date 1 January 2019

End date 30 June 2023

Coordinated by TAMPEREEN KORKEAKOULUSAATIO SR + Finland

Deliverables

Other (4)

Education & training - Novel knowledge delivery activities 1

The means of DIHs to support the SMEs during the execution of the demonstrations is presented. Methods are audio/visual guides, programming support, resolving of integration issues, remote assistance, and tele-installation. All these will be delivered through the selected appropriate delivery mechanism configurations.
Novel solution cockpit linked to TRINITY Digital Access point

Material from the design and execution of the Category demonstrations will become available in the Novel Solutions Cockpit linked to the TRINITY Digital Access point platform. This software cockpit will host all the material from the Internal as well as 3rd party demonstrations while comprise user-friendly graphical interfaces that will provide access to such material in the interested stakeholders and first-time users.

TRINITY initial open event

An initial open event will be organised at the beginning of the project latest by (M12), to explain the objectives of the project and enlarge the TRINITY network of DIHs. Partners will also participate in relevant events organized by other stakeholder (e.g. European Robotics Forum, Digital Stakeholders Forum, EFFRA events) and will present the contributions to the field of the TRINITY project.

TRINITY Marketing kit

Different tools will be used/developed to disseminate project results and communicate with the different target audiences. The dissemination materials to be developed during the project: • Press releases and press kit: A TRINITY press kit will be downloadable from the portal and press releases will be produced. The press kit will be available by M09 of the project and at least two press releases will be developed: one with the kick-off meeting to provide general information about the project, and one with the final dissemination workshop, with the goal of increasing the visibility of TRINITY. • Brochures, posters and banners will be produced at the beginning of the project. A brochure introducing the project, the partners and its main objectives will be developed by M12 of the project. • Experiments factsheets: A factsheet for each use case demonstration will be developed. The factsheet will include including a description of the use case demonstration, its objectives and results.

Documents, reports (7)

Demonstrator introduction

All the proposed demonstrations focus on providing agile production capabilities to manufacturing companies. Demonstrations to be implemented will be introduced to public in this deliverable.

Detailed specification of hardware & software infrastructure at partner institutions

The main aim of internal demonstrations is to provide hardware and software resources needed at all partner institutions working on the realization of internal demonstrations (TUT, CENT, UiT, JSI, LMS, BME, Flanders MakeMAKE, Fastems, LP FhG). The demonstrators at partner institutions will be implemented
modularly so that its main constituent subsystems can be used both as a complete system and separately for each component (facing specific technological challenges). Detailed specification of hardware & software infrastructure at partner institutions are describe in this deliverable.

Documents for the call
Documents for the call: Comprised by (1) guidelines for applicants including the text of the call and evaluation criteria, (2) template for the sub-grantee agreement, (3) call leaflet, (4) application form for applicants, (5) Q&A section and (6) online microsite at the project website and F6S platform.

Map of core and indirectly involved actors
The structure of each DIH with respect to the actors involved and their respective role in the DIH in terms of services needed and services provided. Report on how relationships between different types of actors are defined, which are the services provided by each of them and the ones demanded most often, their beneficiaries (customers), as well as any other value chain implications. The main outcome is a catalogue of actors comprising roles and services from the demand and supply sides that are part of the consortium.

External evaluation guidelines & contracts
The process for evaluation is divided in two phases, corresponding to: external remote evaluation based on applications and an interview with the most promising proposals and the eligibility control by TUT. Guidelines for these will be provided. Documents: • An Evaluation Summary Report (ESR) for each applicant; • A ranking list/reserve list; • Letters informing of rejection decision, informing that they are on the reserve list or invitation for the following steps (sub-grantee preparation).

Design and development of training material and delivery mechanisms
Each responsible partner will identify the requirements on education and training required by the first-time users. Moreover, the identification of the training providers will be described. The means to deliver the required education and training knowledge will be specified by employing the latest of industrial technology and knowledge transfer mechanisms.

Co-Creation Workshop review 1
The results of the questionnaire and of the workshops will be summarized and derived measures according to the raised topics will be reported.

Publications
Framework for accurate simulation and model-based control of hybrid manufacturing processes

Author(s): S. Makris, P. Aivaliotis
Published in: Procedia CIRP, 97, 2021, Page(s) 470-475, ISSN 2212-8271
Publisher: MDPI
DOI: 10.1016/j.procir.2020.07.007

Digital Twin for Designing and Reconfiguring Human–Robot Collaborative Assembly Lines

Author(s): Niki Kousi, Christos Gkournelos, Sotiris Aivaliotis, Konstantinos Lotsaris, Angelos Christos Bavelos, Panagiotis Baris, George Michalos, Sotiris Makris
Published in: Applied Sciences, 11/10, 2021, Page(s) 4620, ISSN 2076-3417
Publisher: MDPI
DOI: 10.3390/app11104620

Enabling Flexibility in Manufacturing by Integrating Shopfloor and Process Perception for Mobile Robot Workers

Author(s): Angelos Christos Bavelos, Niki Kousi, Christos Gkournelos, Konstantinos Lotsaris, Sotiris Aivaliotis, George Michalos, Sotiris Makris
Published in: Applied Sciences, 11/9, 2021, Page(s) 3985, ISSN 2076-3417
Publisher: MDPI
DOI: 10.3390/app11093985

The Intelligent Factory Space – A Concept for Observing, Learning and Communicating in the Digitalized Factory

Author(s): Jan Reimann, Gabor Sziebig
Published in: IEEE Access, 7, 2019, Page(s) 70891-70900, ISSN 2169-3536
Publisher: Institute of Electrical and Electronics Engineers Inc.
DOI: 10.1109/access.2019.2919340

AR-based interaction for human-robot collaborative manufacturing

Author(s): Antti Hietanen, Roel Pieters, Minna Lanz, Jyrki Latokartano, Joni-Kristian Kämäräinen
Published in: Robotics and Computer-Integrated Manufacturing, 63, 2020, Page(s) 101891, ISSN 0736-5845
Publisher: Pergamon Press Ltd.
DOI: 10.1016/j.rcim.2019.101891

Optimal layout and reconfiguration of a fixturing system constructed from passive Stewart platforms

Author(s): Timotej Gašpar, Igor Kovač, Aleš Ude
Published in: Journal of Manufacturing Systems, 60, 2021, Page(s) 226-238, ISSN 0278-6125

Author(s): Janis Arents, Valters Abolins, Janis Judvaitis, Oskars Vismanis, Aly Oraby, Kaspars Ozols
Published in: Journal of Sensor and Actuator Networks, 10/3, 2021, Page(s) 48, ISSN 2224-2708
Publisher: MDPI
DOI: 10.1016/j.jmsy.2021.05.020

An Agent-Based System for Automated Configuration and Coordination of Robotic Operations in Real Time—A Case Study on a Car Floor Welding Process

Author(s): Sotiris Makris, Kosmas Alexopoulos, George Michalos, Andreas Sardelis
Published in: Journal of Manufacturing and Materials Processing, 4/3, 2020, Page(s) 95, ISSN 2504-4494
Publisher: MDPI
DOI: 10.3390/jsan10030048

A Virtual Mechanism Approach for Exploiting Functional Redundancy in Finishing Operations

Author(s): Bojan Nemec, Kenichi Yasuda, Ales Ude
Published in: IEEE Transactions on Automation Science and Engineering, IEEE Transactions on Automation Science, 2020, Page(s) 1-13, ISSN 1545-5955
Publisher: Institute of Electrical and Electronics Engineers
DOI: 10.1109/tase.2020.3032075

Conference proceedings (6)

Digital Twin and Virtual Reality for Safety Training

Author(s): Tero Kaarlela, Sakari Pieska, Tomi Pitkaaho
Publisher: IEEE
DOI: 10.1109/coginfocom50765.2020.9237812

The application of virtual reality in programming of a manufacturing cell

Author(s): Halldor Arnarson, Bjorn Solvang, Beibei Shu
The application of open access middleware for cooperation among heterogeneous manufacturing systems

Author(s): Halldor Arnarson, Bjorn Solvang, Beibei Shu
Publisher: IEEE
DOI: 10.1109/sims49386.2020.9121537

A Simulation-Based Approach for Improving the Performance of a Manufacturing System

Author(s): Mohammad Azarian, Hao Yu, Wei Deng Solvang
Published in: 2021 IEEE/SICE International Symposium on System Integration (SII), 2021, Page(s) 543-547, ISBN 978-1-7281-7658-1
Publisher: IEEE
DOI: 10.1109/ieeeconf49454.2021.9382722

Architecture for task-dependent human-robot collaboration

Author(s): Beibei Shu, Bjorn Solvang
Publisher: IEEE
DOI: 10.1109/ieeeconf49454.2021.9382703

Multilayered Dynamic Safety for High-Payload Collaborative Robotic Applications

Author(s): Sakari Pieska, Tomi Pitkaaho, Tero Kaarlela
Publisher: IEEE
DOI: 10.1109/sims49386.2020.9121469

Datasets

Datasets via OpenAIRE (5)

Used portable batteries with bounding boxes
Author(s): Tomi, Pitkaaho; Sarlin Sami
Published in: Zenodo