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Contact

JRP coordinator: Prof. Hichem Nouira (hichem.nouira@lne.fr)

JRP officer: Dr. Diane Gumuchian (diane.gumuchian@lne.fr)

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DI-VISION

Traceable machine vision systems for digital industrial applications

23IND08 DI-Vision

Industry 4.0 aims to transform industrial processes through the integration of 'smart' technologies such as AI, automation, and robotics, into manufacturing processes. Integral to many high-value industries are machine vision systems (MVSs) where cameras and sensors are used to monitor production.

These systems enable correct part placement during assembly, coordinate robots and detect defects whilst improving efficiency, increasing productivity, and reducing costs. The integration of 'digital twins' could further improve MVSs by providing virtual models of physical objects that use real-time data from sensors to simulate MVSs behaviour and monitor operations. Nevertheless metrological standards, calibration methods, traceability and uncertainty assessment for existing and newly developed MVSs are lacking.

Needs

The rapid growth and innovation in MVSs has brought a wave of industrial applications in many manufacturing sectors.

For quality control, MVSs use cameras and sensors to analyse images, to monitor the quality of the product, and to report in-process deficiencies in quasi real-time. The deployment of Traceable-MVSs is perfectly aligned with zero-defect manufacturing and zero-waste ambitions.

Currently, calibration methods, including the measurement uncertainty of known influence factors, and approaches to identify additional contributions to the measurement uncertainty are still lacking.

To support the implementation of ISO10360-13, additional materials standards need to be developed, which will provide traceability to MVS with validated DTs for assessing systematic errors and determining robust measurement uncertainties. In addition, reference dense matching algorithms are needed for merging recorded images into one coordinate system.

Project Workpackages

The overall aim of this project is to generate traceability for the Machine Vision Systems (MVSs) that are deployed in industrial applications including macro- and microscale products based on the development of traceable material standards, V-DTs, uncertainty evaluation methods, robust and reliable dense-image matching algorithms, as well as robust classifiers and analysing algorithms.