Self-resilient Reconfigurable Assembly System with In-Process Quality Improvement

Dr. Pasquale Franciosa ✉ p.franciosa@warwick.ac.uk

Prof. Darek Ceglarek ✉ d.j.ceglarek@warwick.ac.uk

WMG THE UNIVERSITY OF WARWICK

Introduction

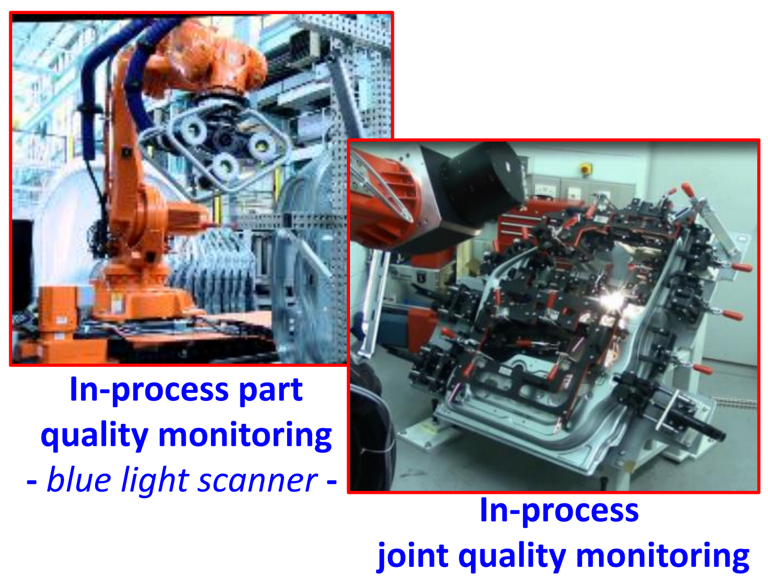
Process monitoring and data mining for quality control are insufficient in modern manufacturing as they lack the capability to anticipate defects before they occur. *This research aims to develop a novel closed-loop quality control methodology which links defect identification with root cause analysis and corrective action for assembly systems.*

It is based on the integration of in-process measurement and data mining with multi-physics variation simulation analysis through the development of simulation-driven surrogate models and closed-loop control strategy.

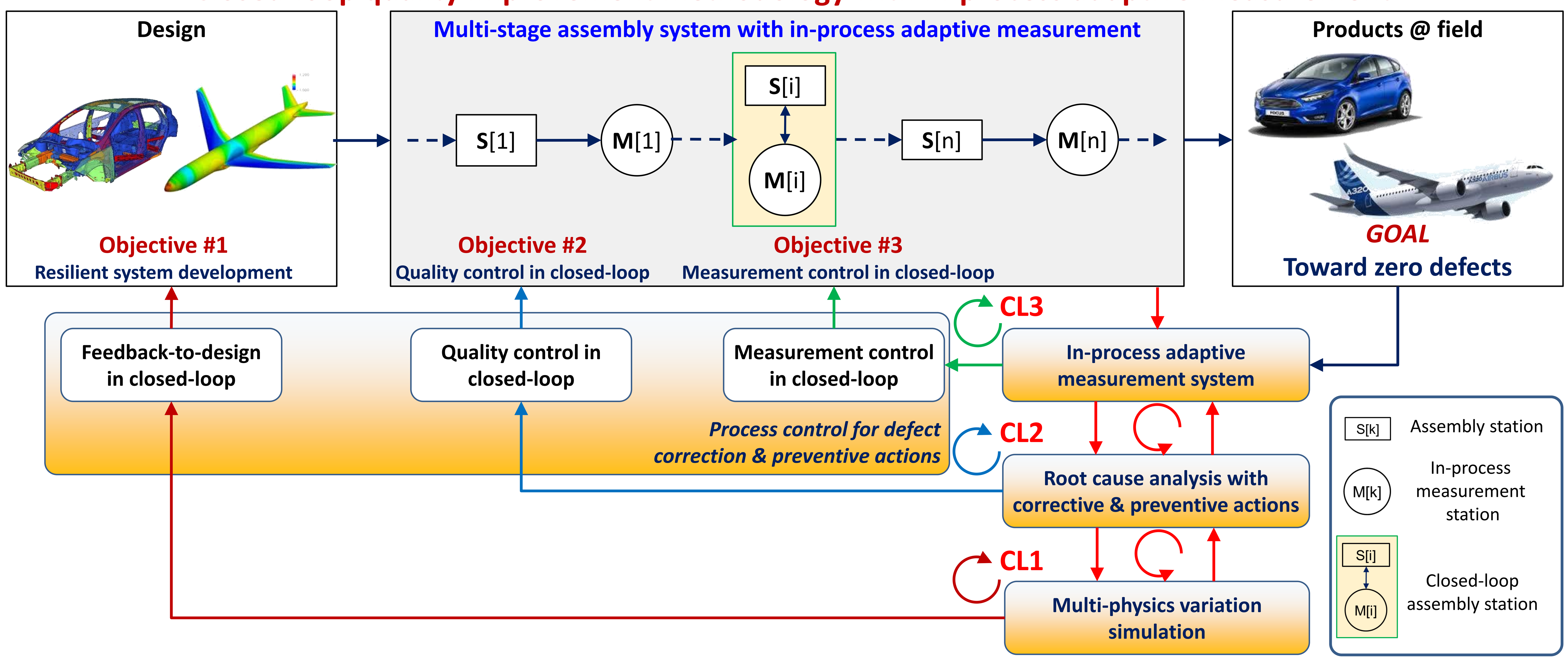
Impact

The broad impact of the project is the integration of reconfigurable assembly systems with closed-loop in-process quality control. The results of the project can help to eliminate, reduce and correct defects before they occur. This will lead to increased productivity and product quality and shortened design phase.

Examples of in-process adaptive measurement stations



Closed-loop quality improvement methodology with in-process adaptive measurement



Objectives

The overall goal is to develop, implement, demonstrate, and pilot in industry, a systematic closed-loop quality improvement methodology with in-process adaptive monitoring capable of self-recovery from 6-sigma quality defects via: (i) defects detection, (ii) root cause analysis; and, (iii) corrective actions and preventive actions (CAPA) synthesis.

Methodology

The proposed approach comprises of three major thrusts:

(i) in-process adaptive measurement system

(ii) root cause analysis with corrective and preventive actions

(iii) multi-physics variation simulation

These three thrusts are integrated into three interlinked closed-loops:

(i) feedback-to-design in closed-loop (**CL1**)

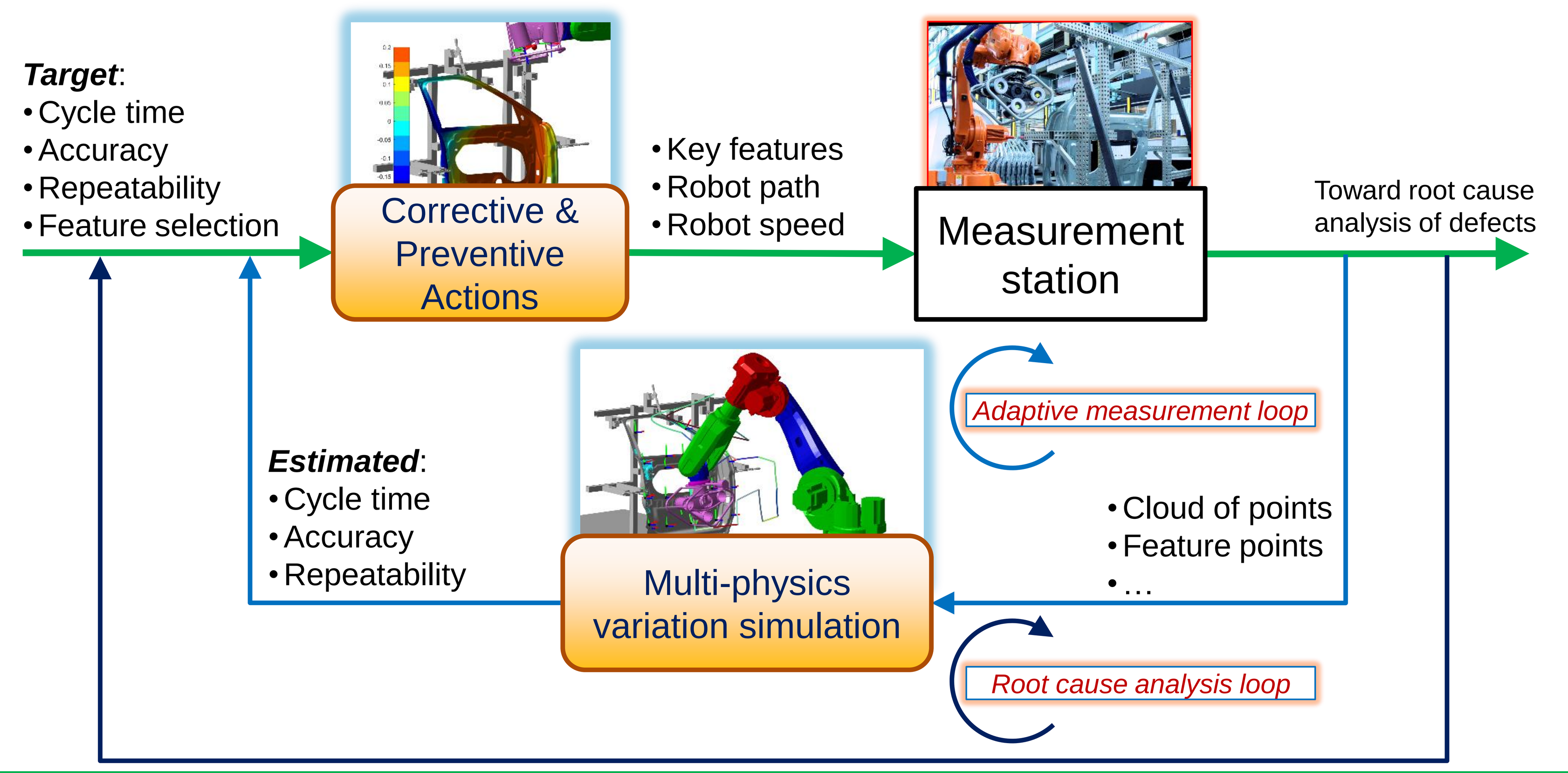
(ii) real time quality control in closed-loop (**CL2**)

(iii) real time measurement control in closed-loop (**CL3**)

Industrial use-cases

It is planned to develop both physical and virtual demonstrators. It is intended to demonstrate the technology in both (i) automotive industry and (ii) aerospace industry.

Example of in-process quality improvement with adaptive measurement system



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