

Universal Calibration for Robot Additive Manufacturing

By Jelle van Kleef, MX3D

Project Details and Motivation

MX3D proposes a solution to address consistency problems in robotic AM. Universal Calibration Tool for Robotic Additive Manufacturing (UCRAM) is a tool that monitors the layer build-up, either to measure and calibrate the material build-up in advance during a calibration procedure or monitoring it layer-by-layer as the print progresses. The tool will create a digital twin of the printed part, by scanning each layer using a 2D-laser scanner, thus building up a 3D-image that can be used for review or to overlay with other available data sets. A simple, fast, and low-cost tool for defect detection and quality control in any type of robotic AM to achieve zero-defect additive manufacturing.



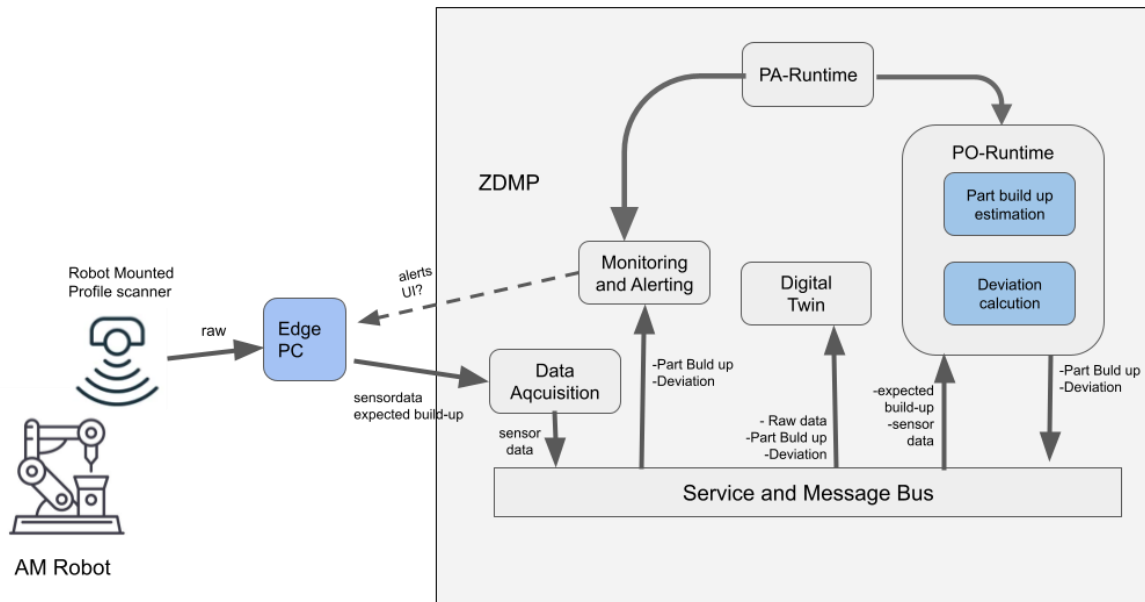
Typical Wire+Arc Additive Manufacturing setup at MX3D

ZDMP Fit

Part build-up monitoring for robotic additive manufacturing processes is a relatively new field. UCRAM will fully integrate 2D scanning technology, various ZDMP components and MetalXL (MX3D's cloud software).

- **Prediction and Optimisation Run-time:** -Runs the functionality to estimate the part build build-up from the sensor data
- **Monitoring and Alerting:** Informs the user of the print progress and any problems that may arise
- **Process Assurance Runtime:** Simplifies configuration of the PO-Runtime and Monitoring and Alerting zComponents
- **Service and Message Bus:** Enables real-time communication between the zComponents
- **Data Acquisition:** Enables getting data asynchronously into the ZDMP
- **Digital Twin:** [Enables Gives the user](#) a contextual overview of the robotic setup

Scanning with a 2D-profile scanner is fairly straightforward, however combining different scans when the object is greater than the field of view, is a new and challenging task, requiring accurate alignment of the robot position and scanner image data. Since the process is inspected layer-by-layer, between extrusions- a sub-second feedback loop is not required. The data is processed in ZDMP, allowing for easy enhancement of the data pipeline.



UCRAM high-level architecture. Blue: UCRAM custom functionality, Grey: ZDMP [zC](#)omponents

Participant Details

- **Organisation(s) involved:**
- **MX3D:**
 - **Web:** www.mx3d.com
 - **Contact:** jelle+zdmp@mx3d.com
 - **Profile:** MX3D supplies industries with robotic 3D metal printing. MX3D is the company that has brought large-scale Robotic Wire Arc Additive Manufacturing (WAAM) and its market to life and made 3D metal printing more flexible, faster and cheaper. With over 20.000kg of 3D metal prints, 20+employees and 10+robots since 2014, MX3D manufactures for a wide variety of industries

ZDMP Details

The ZDMP – Zero Defects Manufacturing Platform – is a project funded by the H2020 Framework Programme of the European Commission under Grant Agreement 825631 and conducted from January 2019 until December 2022. It engages 31 partners (Users, Technology Providers, Consultants and Research Institutes) with a mission to “Provide the platform, components, services, and marketplace to achieve the right product, at the right time, with the right conditions using the right resources.”. Further information can be found at www.zdmp.eu. ZDMP channels 3.2M€ of SME orientated funding to subprojects, such as this one to both facilitate SMEs with their innovations and increase the value of the ZDMP ecosystem

Links

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|------------------------------------|---|
| • Sub project website/blog | https://mx3d.com/services/research/ |
| • Architecture Component(s) | https://www.zdmp.eu/documentation |

- **ZDMP Website**

www.zdmp.eu