

Newsletter #7 - June 2023

Unimetrik Pilot

UNIMETRIK
METROLOGY AND CALIBRATION

Unimetrik is a Metrological Service company, oriented to offering solutions for the industry related to Calibration, Measurement, and Metrological engineering. UNIMETRIK is accredited by ENAC and acknowledged by the principal aeronautic groups in Spain. It is exporting its technology to different countries such as USA or Germany.

Use cases and overview of timelines

The solutions to these use cases will then be applied on the metrological software M3, that is being also used to gather the Point Clouds that make up the dataset for the XMANAI project. **The UNIMETRIK pilot is divided in two different use cases that are related to each other.**

Use case 1: Measurement plan optimization

Assist the junior metrologists in their preliminary study of the part to be measured;
Accelerate the process & minimize costs;
Ensure consistency of results.

Use case 2: Point Cloud optimization

Maximize measurement accuracy;
Minimize execution time;
Ensure consistency of results.

To solve these challenges regarding both use cases, the first datasets for experimentation have been generated, as dimensional measurements of calibrated objects with geometries that are common to industrial metrology studies, such as the sphere and the cylinder. Starting with measurements of calibrated spheres of three different diameters, and moving on to a calibrated cylinder, the focus is on convex geometries to begin with, due to the different response of the scanning instrument to concave geometries. Exploratory data analysis has been performed on the available datasets, uncovering interesting properties, interrelations and hidden patterns in the data. Informative features have been extracted from the available data, taking into account the laser setup and the geometric characteristics of the object under study.

These geometrical features are used as inputs to the ML models, along with the combination of scanning parameters that has been applied to each measurement.

The raw point clouds obtained by measuring objects with those 3 different geometries have been processed to achieve Outlier removal (by differentiating inlier and outlier points), estimation of Surface Orientation vectors (at each point to ensure they are aligned) and Geometric feature extraction.

Regarding the development and validation of Explainable Artificial intelligence models and algorithms, several machine learning algorithms have been applied to the problem, and moreover, selected models have been trained and fine tuned as SVM + Permutation Importance and NN + SHAP.

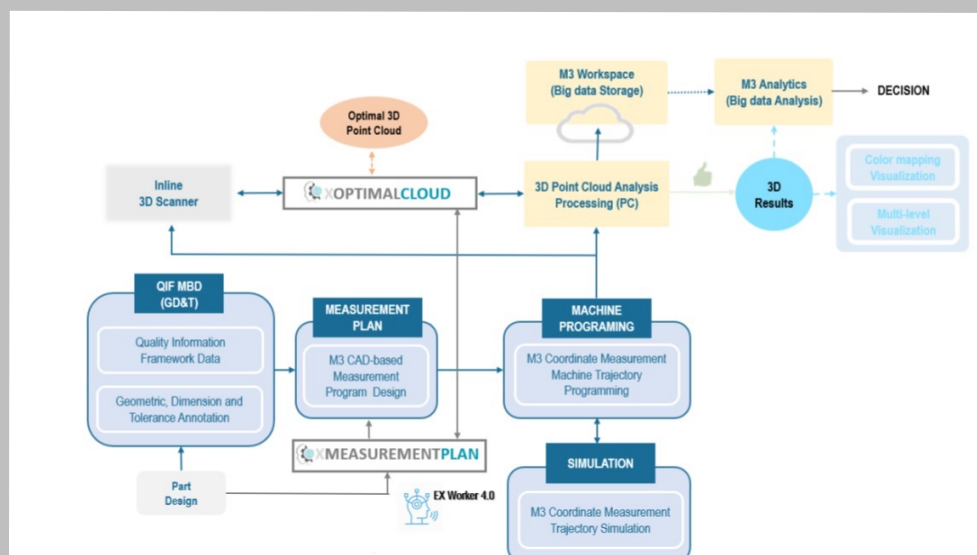
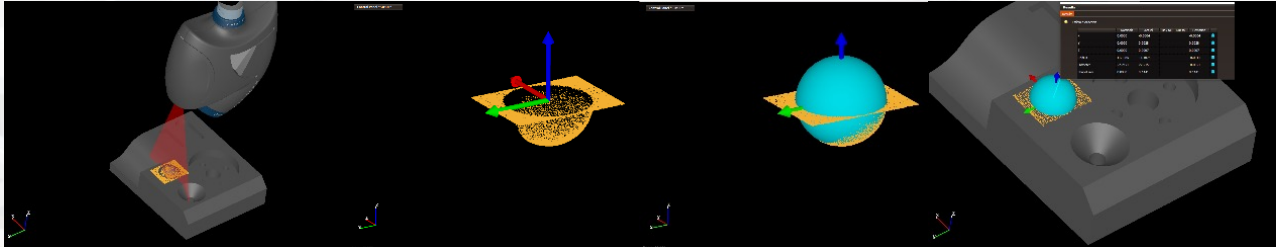


Figura 1. Use Cases in the UNIMETRIK pilot process

Initial Results

The activities performed and the achievements reached during the alpha operation phase for the UNIMETRIK demonstrator, were dedicated to the elaboration and solution of the prediction of pointwise measurement accuracy over convex objects.

This first task of modeling the differential response of the scanning device has been identified as fundamental to address both use cases put forth by the UNIMETRIK demonstrator. Related activities and achievements span across different axes, related to data acquisition and exploration, data preprocessing and feature extraction, the development and validation of predictive XAI models and the design and development of the first version of UNIMETRIK's manufacturing app.



See more
about
Unimetrik
pilot:



Dissemination and Project Activities



The XMANAI - EU Project special session at the IEEE ICE CONFERENCE 2023 was this month.

It is with great pride that we share that XMANAI received an honorable mention at the ICE conference!

This mention was attributed to the presentation of the paper "Explainable Artificial Intelligence Bundles for Algorithm Lifecycle Management in the Manufacturing Domain".

Congratulations to all the partners involved in the project, especially those who actively participated in the preparation of this paper, and thanks to the Conference organizers for the award.



This event will run for 2 days and will take place on 13 and 14th of July in Athens, Greece

Sign up now for XMANAI's Hackathon.

Register now to secure your spot:
<https://ai4manufacturing.eu/hackathon/>



In addition, this month, the 2nd XMANAI Industrial Advisory Board took place with the Support of the Digital Factory Alliance (DFA).

This is an extremely important meeting as it provides an opportunity to receive feedback on Project developments and adjust what is required.

XMANAI - Explainable Manufacturing Artificial Intelligence

Topic: H2020 ICT-38-2020 - Artificial intelligence for manufacturing

From: November 2020 **To:** April 2024

Overall budget: €5 998 902,50



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 957362



Visit us: www.ai4manufacturing.eu