1 AI Service for Module 1 in the Service Life Cycle: Service message

SERVICE MEISTER

AUTOMATIC RECOGNITION OF FAULTY PROCESSES REMOTELY

Faulty processes in machines lead to enormous costs, not only for the customers who have to stop production, but also for the machine manufacturer who has to correct the errors as quickly as possible. A large part of this cost is due to the fact that the technicians have to be on site to identify the problem and solve it. With our service, we want to teleport the five senses of the technicians to the customer with just the push of a button. This creates the role of the Remote Operator, who can react quickly from a distance and thus enable better service. Furthermore, the expertise of technicians in AI methods is applied within a knowledge management system. This allows errors to be classified automatically and appropriate solutions to be suggested. This allows a much more efficient service process to be designed.

FOR THE FOLLOWING CHALLENGES

- Inefficient service processes
- High service costs
- Increasing customer satisfaction
- Skills shortage

THE USE CASE

- Errors often occur in complex machines. These cause downtimes or undesirable interruptions in manufacturing at the customer's site.
- The customer reports the error to the machine manufacturer, who should be able to respond as quickly as possible.
- The manufacturer usually needs a lot of time to detect the error and fix it afterwards. The reason for this is the distance between the machine and the technician, which makes it difficult to investigate and rectify the error.
- Although the customer can offer a description of the error by phone or similar, this is usually not sufficient, as complex machines are involved.
- Usually, the manufacturer sends a specialised repair team to undertake an on-site investigation.
- This team is responsible for identifying and fixing the error. There are many reasons that can lead to a delay, such as the cause of the error being unclear or the required spare parts being missing.
- As a result, the manufacturer not only incurs high costs, but the relationship with the customer can also be negatively affected.

THE SOLUTION IN DETAIL

An infrastructure concept is provided to transfer any data from the machines at the customer's site online. This service also includes the appropriate software to display the data in a user-friendly way and to enable interaction with the data. Here the data can be classified with labels. These labels become the basis of a detection model to classify errors and build a recommender system for solutions.

- The hardware structure consists of many components such as cameras, computers, cabling and network distributors.
- The data is managed in the cloud to take advantage of a more flexible infrastructure so that the system is scalable.
- The software for the remote operators is a dashboard that also runs in the cloud and is available to all service employees. On this page the data is visualised and assigned.
- A lot of emphasis is placed on the visual data or videos. Features like zoom, slow motion, time lapse, highlighting regions of interest and so on are to be expected.
- Comments, tags and similar functionalities promote collaboration and speed up labeling, which is important for the assignment of errors.
- The labels are used to automatically detect and cluster the errors. This clustering will provide insights into the machines.
- The actions taken by the technicians are stored in the knowledge management system. In this way, possible solutions for future, similar errors can be suggested via a recommender system.
- Since the errors are detected much earlier and a possible solution is even suggested, the service employees can carry out the repair from a distance by contacting the employee on site.
- If the repair requires a technician on site, the preparation is facilitated by assigning the errors to corresponding experts or by ordering spare parts in advance.

PROJECT STATUS

The solution is still under development. A first hardware system has already been implemented as a prototype at a customer. The data or log files and videos from inside the machine are successfully streamed and the most important video snippets are transferred and stored on a storage account in the cloud. This data is displayed on a dashboard. The service technicians can view all of the data on this dashboard and discuss and classify the error together through comments and tags. Plans are underway to implement a first use case in which faulty processes in automation will be automatically detected by a TRUMPF machine.

REQUIREMENTS

- Initial outlay to set up the system or install the hardware at the customer's premises
- Privacy issues, especially for the visual data
- Infinite error classes in practice
- Recognition model and recommender system need a minimum number of labels before they can support properly.

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SERVICE MEISTER

SPECIFICATION

AVAILABILITY

- General infrastructure concept of the solution can be shared and discussed in detail.
- If you are interested, please contact the following TRUMPF employees: korbinian.weiss@trumpf.com guillem.boada@trumpf.com

	Input data	Preprocessing	Data storage	Algorithms	Interfaces
High-Level Description	Videos and images during part-taking from inside the machine	Removal of uninformative and privacy-sensitive parts of the videos. Linkage of further data.	Archive with image, video and metadata	Neural network for binary classification	Web dashboard with display of videos and API
Configurability	Select cameras that provide different views. Parameterisation of the image acquisition.	Select algorithms to create pre-processing of the videos. Select method for parsing log files.	Select properties from the database	Different models, hyperparameters, thresholds, etc.	Different views, zoom, slow motion, time lapse, etc.
Technical Implement ation	Upload in Azure Blob Storage	Python script within an Azure Function and storage in databases.	Azure Blob Storage	Python Script on Azure Machine Learning	React on Azure
Specific example from the speedboat project	Video of 20 seconds centered on the part removal (20 seconds before and 5 seconds after)	Parsing of metadata and preprocessing of video, e.g. Detectron, to “blur” people.	Azure Blob Storage with directories and tables	Detection of uncut or stuck edges	List of partial extractions. By clicking on a row, you go to the videos and other information.

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