LOGIC.IDENT

Fraunhofer Institute for Production Systems and Design Technology IPK
Pascalstr. 8–9
10587 Berlin

Your Contact
Johannes Hügle
Automation Technology division
Phone: +49 30 39006-198
johannes.huegle@ipk.fraunhofer.de

www.ipk.fraunhofer.de/logic

AI-based recognition of industrial components

The latest digital image processing technologies facilitate what was unimaginable a few years ago: object recognition with superhuman accuracy. However, the tools resulting from basic research now have to be adapted for industry. Logic.Ident is an intelligent, platform-independent assistance system for identifying industrial goods.

Part recognition across the entire product life cylce

Every product, be it a consumer good or an industrial item, is monitored with respect to its economic viability from its creation to its removal from the market. This type of tracking takes place in both the forward and backward facing supply chain, implying that new as well as old and used parts are included in this observation.

Identification via barcodes or similar markers is not always possible. Usually, only assemblies are provided with markings, and these can be damaged or soiled during the product life cycle. Identification of parts in an assembly is often associated with a human-executed manual search in catalogues or databases. This time-consuming and therefore cost-intensive search also requires expert knowledge that is not always available. Quality, robustness and reliability of the identification process can therefore not be guaranteed.

From research to factory

The neural networks developed specifically for image processing, so-called Convolutional Neural Networks (CNNs), are currently the most successful tools in the field of digital object recognition. They are part of the artificial intelligence (AI) supervised learning methods. In order to be applied reliably, these large network structures require large amounts
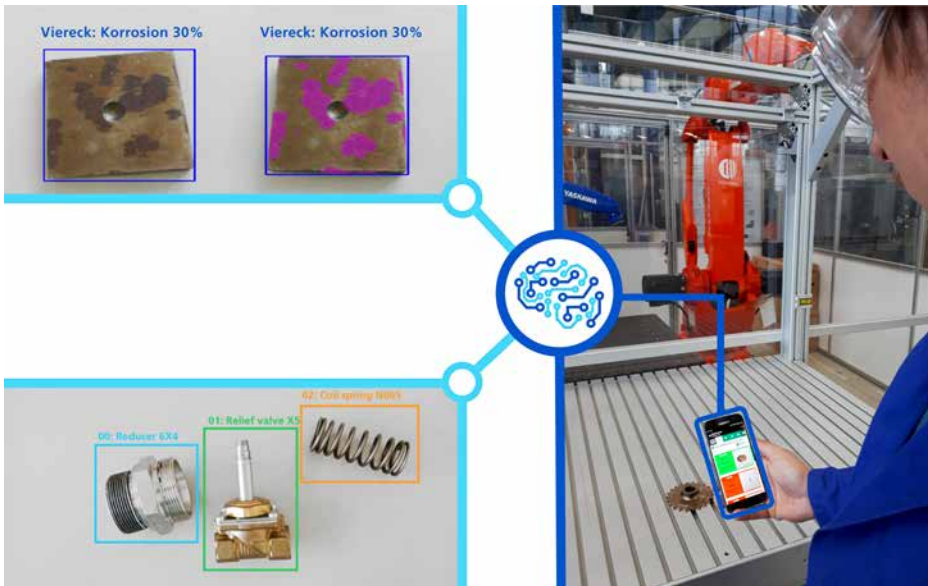
Image: *Different services can be set up via the service architecture. In addition to component identification, defect detection can also be easily integrated (e.g. for rust, as shown here).*

of visual training data, which are often not readily available in industrial applications.

Logic.Ident offers a platform-independent approach for applying AI-based image processing methods to identify industrial components. It contains an intelligent data management system and an intuitive, customer-oriented user interface for successful integration and application. The starting point is a small initial data set, in which all objects to be identified are represented in small quantities. Transfer learning techniques (targeted application of prior knowledge) and data augmentation (artificial enlargement of the amount of data) already facilitate very good recognition accuracy. Each application results in further data acquisition, which incrementally improves recognition by continuous system learning.

Future research will continue to focus on demonstrating the potential for artificial intelligence in image processing and on making it usable for production and logistics processes. At the same time, it is important to make these methods understandable for non-experts, in order to strengthen acceptance for using AI methods.

Overview Logic.Ident

Challenges:

– Integration into industrial environment
– Often very similar looking objects
– Shiny, reflective surfaces
– Small amount of image data

What Logic.Ident offers:

– Solutions for object recognition in an industrial context
– Support in targeted data collection and preparation for the use of AI methods
– User-friendly and client-specific user interface
– Further development and adaptation of latest research results
– Observance of laws and company guidelines regarding data security and access

Technological:

– Platform independence due to browser-based applications
– Fast plug-and-play integration of various detection sensors (webcam, industrial camera)
– Fully scalable systems in terms of size and functionality
– Easy integration of new features thanks to a flexible service architecture

– Local or cloud-based data management on request

Methodical:

– Use of the latest intelligent image processing methods
– Support in acquisition of training data
– Use of domain knowledge for creating data sets
– Adding new objects without the need for re-training using the entire training data

Areas of application and customer benefits:

– Supporting the warehouse management system through automated detection of removed parts
– Identification of new, old and used parts upon receipt of goods
– Mobile object identification via smartphone
– Data storage and identification process can be integrated both locally and in a cloud storage