

*Success Story***Fast and robust bulk code reading with MVTec HALCON**

Challenges presented by the EU Falsified Medicines Directive can be overcome

Machine vision is becoming more and more important in nearly every branch of industry. Increasingly, solutions based on image analysis are gaining currency, not least due to challenges brought about by the Fourth Industrial Revolution – digitalization and networking by means of production. The market for companies that offer machine vision solutions is still new and has been growing consistently for a number of years with no end in sight.

The industry trend toward supporting process monitoring, quality control, packaging processes, completeness inspections, etc. with digital technology is affecting every sector. In the food and beverage industry, products are being measured, quality is being monitored based on visual criteria, and printed sell-by dates are being verified. Pharmaceutical companies are recording and automatically verifying pharmacy product numbers (PPNs) via data links and are monitoring drug ingredients. Mechanical and plant engineers are using cameras to control production and packaging processes. The possibilities for using machine vision to obtain information and control processes are virtually unlimited. Last but not least, a segment of the increasingly important development of artificial neural networks for promoting artificial intelligence (AI) is also focusing on the processing of image data. This branch of artificial intelligence is used to develop autonomous vehicles or autonomously acting systems.

The pharmaceutical industry in particular has strict guidelines pertaining to the safety, labeling, and documentation of medicines. The EU Falsified Medicines Directive, which has been in force in Europe since February 9, 2019, requires all prescription drugs to be authenticated before being dispensed to patients. This is done using a safety feature in the form of a data matrix code that must be attached to all prescription medicines. The code contains the product and serial numbers, expiration date, and batch number. A product's authenticity can be verified at any time by comparing it with a database containing every medicine currently in circulation. This requirement results in a great deal of effort for manufacturers and distributors when it comes to packaging as well as checking this variable code, which must be printed on every box. To shorten the process time, this data is aggregated when the product is packed in boxes and when it is inspected on receipt. For this purpose, large quantities of data must be read simultaneously.

It used to be common practice to record each code individually using a handheld scanner – a process that was extremely time-consuming and resulted in a high error rate. Enormous demands are placed on machine vision systems because variable data in very small print must be read quickly and reliably. However, the technology faces even more challenges. Among other things, codes on as many as 300 packages must be read reliably at one time. In wholesale as well as import and export operations,



constantly changing formats (colors, sizes, etc.), generally codes with poor contrast and reflective surfaces, must be recognized. In addition, the software must contend with fluctuating working distances because the packages bearing the codes are aggregated in boxes or shipping crates and stacked in multiple layers.

The way to meet the above-mentioned challenges is with a complete, integrated solution that focuses on different technical features. Safe-Ident Code is a new product from Strelen Control Systems GmbH, a machine vision company with headquarters near Frankfurt, Germany, and in Eastern Switzerland. Compared to the conventional practice of reading each individual code with a handheld scanner, the complete solution offers considerable benefit by speeding up



processing by a factor of 100. User errors (such as posting medicines twice or not at all) can now also be prevented by reading in the codes electronically. The solution is based on the machine vision library in the standard machine vision software MVTec HALCON that is integrated into the inspection system's graphical user interface and ensures high reading quality and fast processing. The optical components used guarantee an extreme depth of focus and a very high resolution of 21 MPixel with outstanding visual properties. To this are added automatically adjustable focal length and focus, illumination by means of extremely homogeneous LEDs, polarizing filters to eliminate reflections and disturbances due to extraneous light, and an integrated frame with extraneous light shielding and ergonomic access.

MVTec HALCON is used to decode the data matrix codes in the camera image. The camera image is first read in. Following a number of preprocessing steps, the data matrix codes are detected and decoded, and the resulting data is finally output. The primary purpose of preprocessing is to read all the codes quickly but extremely robustly, which is crucial for large data volumes such as those produced with a 21 MP camera. With the aid of various morphological operations performed by the HALCON library, it is possible to reduce the data to be processed to a fraction of its volume in just a few steps.

The images are then evaluated. A model of the codes to be identified is first created using the HALCON operator `create_data_code_2d_model`. For this purpose, the user can define certain parameters, such as the polarity of the code to be read. In the next step, HALCON detects the codes in the image that correspond to the model based on the `find_data_code_2d` operator and reads out the information they contain.

The information thus obtained is output in the form of decoded strings and additional control output parameters, such as the position of the code or a surrounding rectangle (iconic output parameters).



Since the application is designed to be very broad and flexible, the user needs to make very few modifications. However, if the customer has different requirements, changes within the machine vision system can be made simply and easily and implemented in just a few minutes.

The decision to work with HALCON was based on the comparison of the software with various other machine vision libraries available on the market. Strelen focused on the reading reliability of the DMCs, speed, and the ability to read the smallest possible modules. During these tests, HALCON clearly stood out from its competitors.

The EU Falsified Medicines Directive, which went into effect on February 9, 2019, forces drug importers in particular to act quickly. Consequently, Strelen Control Systems was able to post a large number of new orders in the second half of 2018. Since similar laws are in effect or are being implemented in many other markets, a campaign will be launched in 2020 to market this solution internationally.

For more information, visit <https://info.strelen.net/services/en/code-2/> and www.mvtec.com

The original text in German has been kindly provided by Strelen Control Systems GmbH.