COGNEX

OCRMax: Achieve Automated Character Reading Accuracy Rates Above 99%

While computers cannot yet write a great novel, many industries enjoy the benefits of teaching machines to read.

Using optical character recognition (OCR) and optical character verification (OCV) technology, machines in the retail, manufacturing, pharmaceutical, food and beverage industries monitor supply chains in real time—from receiving raw materials to shipped product—cutting inventories and waste and driving productivity.

For example, document handling and high-value manufacturing companies around the globe have used automated OCR/OCV readers to increase production throughput while cutting commissioning and shipping costs. The pharmaceutical industry also appreciates the throughput advantages and labor savings of OCR/OCV systems while also using the technology to comply with government regulations. And after a number of salmonella and other health scares, the food processing industry is quickly following the pharmaceutical industry as it strives to stay ahead of proposed government regulations requiring unit-level product tracking and tracing to limit public health risks from contaminated food.

But as with any technology, results are only as good as the tool.

OCRMax™, a font-trainable OCR and OCV tool, has set industry records for ease of use, read rates and speed in complex images. Using OCRMax helps improve overall read rates from the industry-standard level of 93-95% to 99% and above.

OCRMax Responds to Changing Manufacturing Needs

OCRMax is a unique tool that works with both In-Sight® vision systems as well as VisionPro® vision software. Cognex designed OCRMax and tested it on tens of thousands of images from a huge variety of industrial applications. The tool achieves unprecedented read rates for OCR and OCV applications even under the most challenging conditions, while giving the customer the flexibility to optimize their system for speed, read rate or a combination of both. Cognex developers also spent considerable time and effort to make sure the high-level graphic user interface (GUI) keeps programming simple, while adding the ability to perform OCR/OCV effectively, and included more user settings to improve overall read rates. This combination of flexibility, capability and simplicity exists only with OCRMax.

Most OCR/OCV tools on the market today are proficient at reading black OCR A and B fonts printed in a sterile environment on a clean white background with 93% or better read rates. However, these ideal conditions do not exist in most industries.

While the pharmaceutical industry has deep experience with OCR/OCV applications driven by government regulations that require standardized solutions across all production and packaging, most customers do not use standardized fonts, software or hardware. Seeing the growth in number sorting and tracking applications, Cognex engineers realized that they needed to redesign their existing OCR/OCV tools to:

- Learn and read any printed font;
- Read text even when there is little contrast between type and background;
- Read text even when there is significant variation in width and height;
- Read text when letters are touching, skewed, and distorted; and
- Differentiate between similar shapes, such as the letter "O" and the number "0."

The exceptional performance of OCRMax in comparison to other OCR/OCV tools is based on several factors, most notably better approaches to image pre-processing, segmentation, classification, a dual-verification process, fielding and font training and management. When combined together, these features give users the chance to optimize the OCR/OCV for millisecond character reads, 99.99% read rates, or anywhere in between.
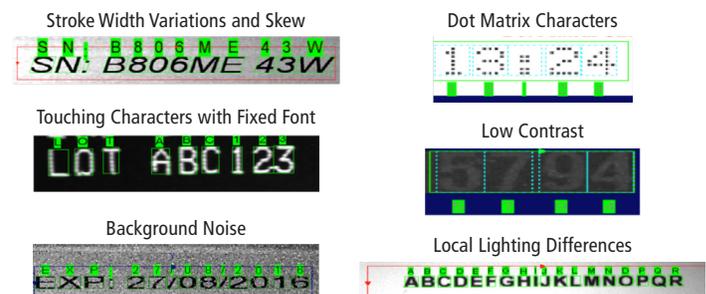

Figure 1: OCRMax easily handles a wide variation of character appearances

Segmentation: First Step in Achieving 99.99% Accuracy

Just as a building needs a strong foundation, the improved performance of OCRMax is based on a careful compromise of powerful image processing algorithms wrapped in an easy-to-use programming interface.

The Segmentation process first breaks down each line, sets regions around each characters and automatically segments them. Next, segmentation parameters are adjusted in order to get boxes around each character. Each character is broken down further into small fragments and the Segmenter finds each letter based on skew, min/max height, min/max width, minimum aspect ratios, angle/skew, intercharacter gap, intracharacter gap, and other characteristics that define the font to the OCRMax tool. Finally the characters are trained so they can be recognized.

To improve read rates, the OCRMax Segmentation tool also provides a noise filter, stroke width filter, compensation for changing lighting conditions, and automatic character scaling.

Figure 2: OCRMax sets region around characters, automatically segments them, adjusts segmentation parameters, and provides fielding information (optional)

Fast, Easy and Flexible Font Training

OCRMax allows users to train entire string of characters in one single step. You can also train or remove single characters, train multiple instances of same characters, and load or save trained fonts to your application.

Fielding: The Final Check

Fielding is an optional programming step that provides OCRMax with additional information about the string of characters to either reduce confusion or allow OCRMax to work as an OCV tool to verify a given character string. For instance, a given character string may be solely comprised of letters or numbers, or the fifth character box from the left within a given string could always be a letter or number. If OCRMax
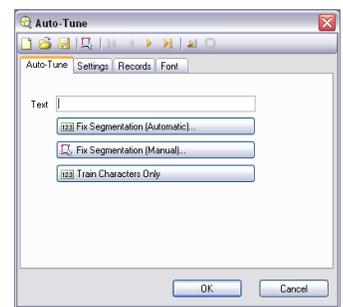
reads a string of characters, and the confidence threshold setting leaves some doubt whether the character is a letter B or number eight (8). Fielding rules programmed by the user give OCRMax another way to determine the proper character value.

Fielding functionality featured in OCRMax allows wildcards, and works with defined variable length strings (this serial number should be between three and five characters, for example) as well as fixed length strings.

While many OCR/OCV tools have fielding capabilities, OCRMax is the only tool that can use fielded strings in both fixed and variable length character sets. As an example, a variable length character string may have the year embedded in it, but the location varies depending on the product and lot number. Using the Fielding tool, OCRMax will read the character string and then search for the expected year code within that string, regardless of the overall length. If the year is not located, OCRMax will "fail" the character string based on the customer's preset Fielding rules.

Auto-tune functionality speeds setup

Unlike other OCR reading tools, OCRMax technology includes an auto-tune capability. A few clicks of a button will run the auto-tune feature. Auto-tune dramatically decreases the time it takes to set up the tool by acquiring a sample image and automatically adjusting the tool to its optimal segmentation parameters which otherwise would be done manually. While finding the segmentation parameters auto-tune also trains the characters at the same time. For difficult to read codes, you can manually finely tune the segments as well as train specific characters not automatically found in the auto-tune process.

COGNEX

www.cognex.com

Corporate Headquarters
One Vision Drive Natick, MA 01760 USA
Tel: +1 508 650 3000 Fax: +1 508 650 3344