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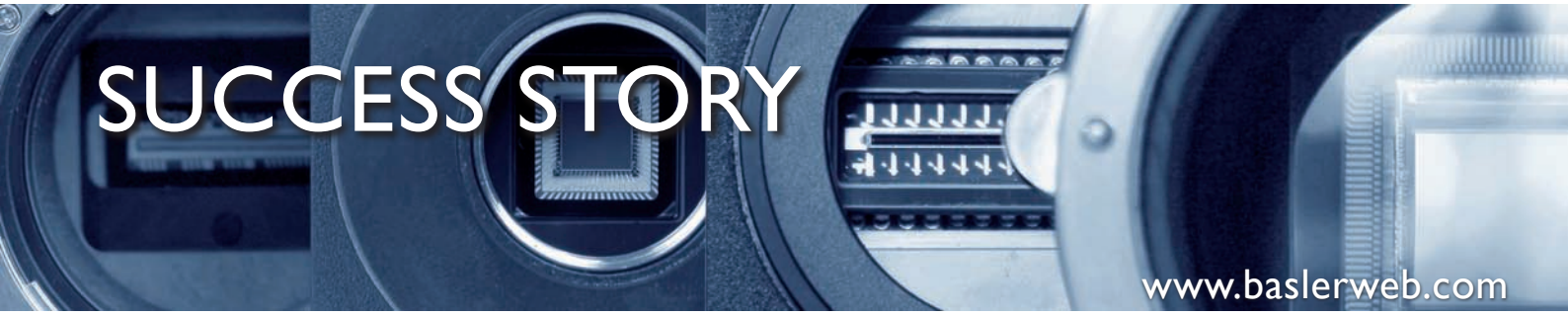


Machine Vision Systems in the Dutch Orchid Industry – A Flower Power Success

February 2008 - "Artificial eyes" have found their way into more and more applications where inspection with human eyes is not sufficient or appropriate. This technology is so flexible that it can be used in numerous applications and for many purposes such as automatic quality control, measurement, identification, or monitoring.

The Netherlands are one of the main exporters of flowers worldwide. With the mechanized inspection of orchids, vision technology has successfully entered the Dutch flower market. Through the use of machine vision, growers have significantly increased their production efficiency, flower quality, and customer satisfaction, and they have gained ground in the worldwide flower market.

ARIS BV delivers vision solutions to several flower producers. Based on their own software and on cameras from Basler Vision Technologies ARIS BV builds inspection systems to check and classify Phalaenopsis, a subspecies of the Orchid family. This is a true success story.

From an idea to success

In the late 1980s, Gerrit Lebbink started a company and named it ARIS BV. Several associates teamed with him to develop innovative vision software. Their fascination with pattern recognition and associative memory helped them create one of the finest color segmentation algorithms imaginable. Since frame grabbers and computers fast enough to handle complex calculations with real time requirements were just becoming available, their ideas were right for the time. Technically, everything was in place, but the market was not ready - yet.

ARIS BV achieved their first success by delivering a poultry classification system to Stork Food Systems. The huge potential of their intelligent software, however, did not really come into effect until 2001. At that time, LevoPlant recognized the relevance of their vision software for grading Phalaenopsis. Many greenhouses followed, and because the Netherlands are the largest breeders of Phalaenopsis in the world, ARIS BV's current installation base is staggering. From the beginning, ARIS has enjoyed a fruitful working relationship with a wide variety of satisfied customers. Machine vision systems from ARIS currently inspect over 2 million products per hour by using the smart interpretation of more than 10 million images.

Nature as a challenge for machine inspection

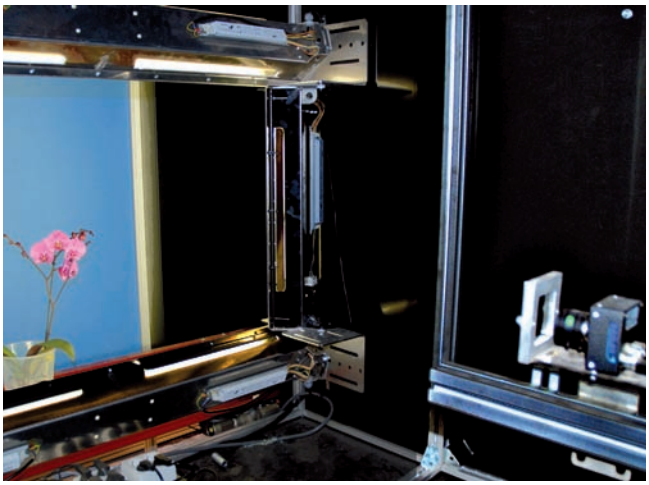
Natural products such as Phalaenopsis are characterized by their inherent variance. In other words, it is impossible to have two plants that are exactly the same. Some customers are only interested in a Phalaenopsis with specific characteristics. ARIS classifies these plants by using a set of key features. These include the color and size of flowers, the number of flowers, knots, branches and sub-branches, and the overall size of the plant.

Traditionally, this classification was done manually. However, manual inspection is subject to inconsistent performance by a classifier over time and to inconsistencies between classifiers. These drawbacks are overcome when classification is performed by a machine vision system.

Classification of Phalaenopsis is not an easy task. A Phalaenopsis has many concave segments, which means that some parts of the plant occlude others. This is especially true with a Phalaenopsis that has several branches and flowers. Features such as the number of knots and flowers can not be interpreted reliably from just one image. To cope with this complexity, the vision system combines a sequence of 32 images of each plant taken from different angles. This sequence is obtained by rotating the plant in relation to the camera. By combining the images, the global shape of the plant can be extracted. Depth is measured by occlusion, the rotation model of the system, and visual cues like the shape of shadings. Using these shapes results in an increase in the reliability of key feature interpretation. This all leads to excellent classification performance.

Great components make great inspection results

A capable camera is a key factor in the vision systems designed by ARIS. The inspections tasks require the best possible images, and these images can only be acquired by high quality, high performance cameras. ARIS uses three different Basler FireWire-b camera models which are distributed exclusively by DVC machinevision B.V. in the Dutch market:: the A102fc and the scA780-54fc and scA1400-17fc from the Basler scout series. Rien den Boer from ARIS explains: "From the beginning, Basler has been our first choice. After testing different types of cameras from several manufacturers, we can state that Basler's mega pixel cameras are unsurpassed."



For the inspection of orchids, cameras must have both high resolution and high sensitivity. Phalaenopsis' growers are interested in the global shape of the plant. At the same time, they also care about the smallest knots on the plant's branches. This means that information must be extracted from each image at a wide variety of scales, which requires a high resolution camera. In addition, sharp images of a rotating plant can only be obtained if the depth of field is adequate and the shutter is fast enough. Both of these factors have a negative impact on the total amount of light available to the camera's sensor. Because the lighting system has limited luminosity, the sensitivity of the camera must be exceptional in order to deliver noise free images. Finally, the color segmentation algorithm relies on an excellent color response from the camera.

So in the end, it is "unromantic" high-tech, among other factors, that helps to deliver the wonderful flower that customers enjoy so much…

Please visit the following websites for reference:

- *www.arisbv.nl*
- *www.machinevision.nl*
- *www.baslerweb.com*

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