



A Rockwell Automation Company

## **Pioneer Hi-Bred International Inc. The University of Arkansas Image Application Development**

### **The Client:**

Pioneer Hi-Bred International, Inc., a DuPont company, is the world's leading developer and supplier of advanced plant genetics to farmers worldwide. Headquartered in Des Moines, Iowa, Pioneer develops, produces and markets a full line of top-quality seeds and forage and grain

additives and provides services to customers in nearly 70 countries.

The University of Arkansas and its Department of Food Science is a recognized world leader in food studies.

### **The Requirement:**

The development of new and innovative varieties of seeds is an expensive venture. Pioneer desired a means of protecting their investment. They contracted the University of Arkansas to develop an automated sampling system that could very quickly take DNA samples from a large set of corn kernels.

The University of Arkansas developed a probing mechanism to take the DNA samples, however a

means of automating the positioning of the probe was needed to allow a quick system.

Hinz designed a vision system to allow the placement, automatic seed recognition, and coordinated capture to allow automated sampling of the corn kernels.

### **The Design Solution:**

The vision system that was developed had a number of functional requirements. It first had to determine the orientation of the corn kernel, so that it could be determined whether or not the germ of the kernel (the DNA-containing portion) was facing up or down. Secondly, the system had to discriminate between the germ area of the kernel and the starch area so that the probe would take a sample in the proper part of the kernel. Thirdly, the system had to find the correct sample points in the kernel, independent of the kernel position or rotation.

The kernel was illuminated from the top by two fiber optic light tubes. A camera was connected to

a PC-based image acquisition system and software was written using the Matrox MIL library.

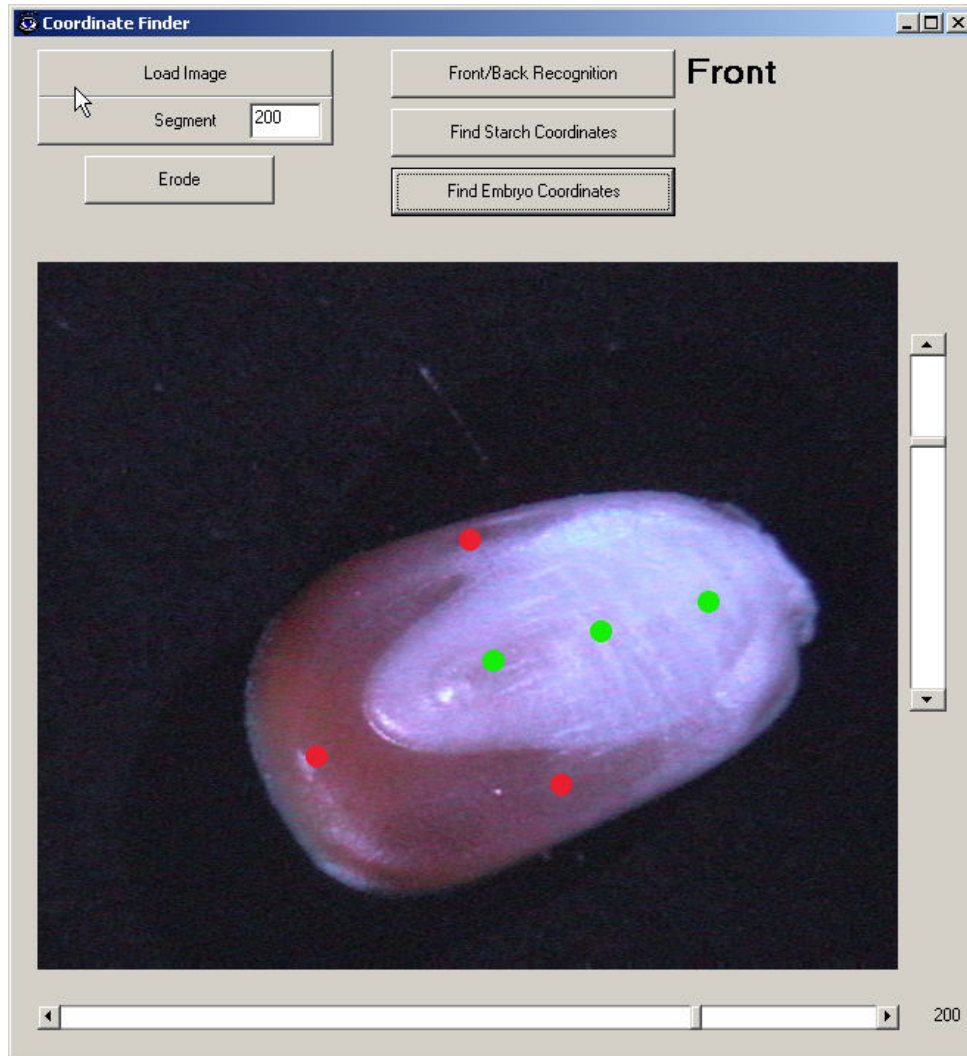
The position of the germ-side was determined by using a neural network classifier which learned the patterns from eight physical features of the kernel measured from the image. A neural network achieved a 98% accuracy in the discrimination.

Corn region discrimination was done using a blue color filter and a thresholding/erosion algorithm. Sample coordinates were then found in the region using a procedure developed by Hinz specifically for the corn kernels.



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**System Specifications:**

- PC-based image acquisition system
- Application specific software based upon Matrox MIL libraries
- Neural network image classifier
- Operating speeds of greater than 1 kernel per second.

**For further information or to contact a Hinz office near you, please check our website at:**

**[www.hinz.com](http://www.hinz.com)**