



A Rockwell Automation Company

Agpro Grain Grain Analyzer

The Client:

Agpro Grain operates a large terminal in Saskatoon that is a major transportation hub for the movement of grains of all types. There is a full time staff of expert grain graders who are

employed to classify the various grades of grain handled by the terminal.

The Requirement:

Grain is typically graded and classified by hand by highly trained graders. However, since this is a highly subjective procedure there are often differences in the assigned grades for particular samples of grain between different graders. A grading system based on computers and cameras is required that will be repeatable and consistent using off the shelf components for the image analysis and determination of the grade of grain.

The following characteristics of the grain need to be measured:

- Analyze wheat for Hard Vitreous Kernel (HVK) percentage
- Analyze wheat for greenness
- Analyze canola for greenness
- Distinguish between canola and wild mustard

A prototype machine vision system that can perform these tasks is to be developed

The Design Solution:

A Pentium 166 computer with a Flashbus color Framegrabber and Sony color camera formed the core of the image acquisition system. The WiT 5.0 software package was used to develop an image acquisition and analysis routine that was capable of reliably and repeatedly providing a correct analysis of a grain sample that was presented to the camera. During the course of the investigation, it was found that the primary information required for classifying grain was color based. The color model used greatly influenced the complexity of the algorithm. Using an RGB color model would have required simultaneous processing of three images (red, green and blue) to distinguish subtle color variations. By converting the image to the HSI (Hue, Saturation, and Intensity) color space the

differences between HVK and NVK are isolated in the saturation component of the image, and thus requires processing of only a single image at a time. We were able to develop an algorithm that was based primarily on the relative changes in color across the sample, and as such was much more robust with respect to variations in lighting and presentation. Proper lighting and presentation are still very important, and a computer controlled precision light table and ring light were also used to obtain good results. The results obtained demonstrated repeatability of 10% between samples that had been pre-sorted and graded by expert grain graders.



A Rockwell Automation Company

Agpro Grain Grain Analyzer

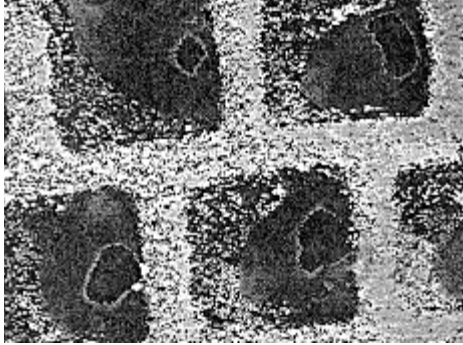


Figure 1. Saturation component of color image

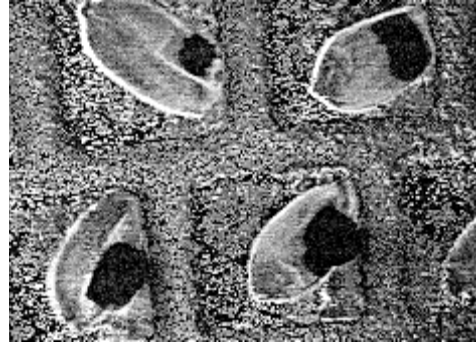


Figure 2. Hue component of color image



Figure 3. Intensity component of color image

System Specifications:

- Pentium 166 Computer
- Flashbus Color Framegrabber card
- Sony DX151 color camera
- Fostec Light Table and Ringlight

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

www.hinz.com