CLEMEX

Thread Characterization

Image Analysis Report **269**

Sample Description

A TIFF image was submitted for thread analysis. The image was taken at 20x with a calibration factor of 5.85 µm/pixel.

Purpose of Analysis

Demonstrate the ability of the image analyzer to discriminate the threads and to measure the height, the pitch, the radius of curvature and the included angle.

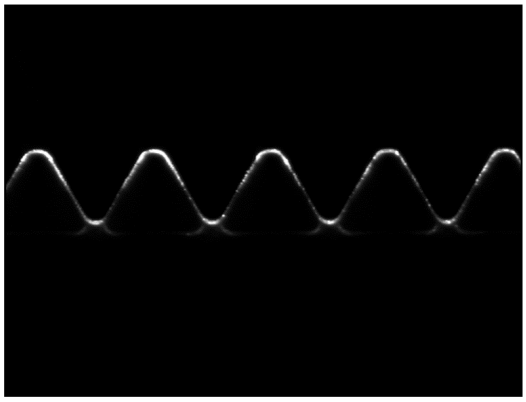

Figure 1: *Original Tiff Image (20x).*

Procedure

A *Top Hat* gray instruction was applied on the original image, helping the binarization process. After the binarization by *Gray Thresholding*, some binary operations were used to remove artifacts and resize the green bitplane (*Trap, Closing, Thin*, *Pruning*). The height was then measured.

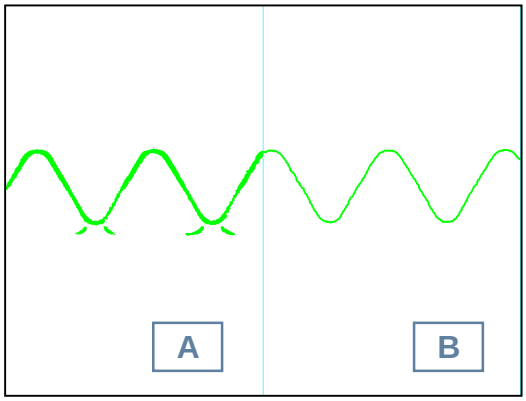

Figure 2: ***a)*** *Binarization of the threads into green bitplane using the Gray Thresholding.*
b) *Final detection of the threads after binary manipulations.*

Procedure (continued)

The radius of curvature was obtained by combining several cycles of Convex Hull, Opening, Closing and Dilate instructions. This isolated the rounded part of the hills and valleys. The Pitch was measured by combining (*Boolean*) a central line (*Square Grid*) to the thread detection. Hills and valleys were filled to obtain a measurable triangle (included angle).

The main difficulty encountered was in obtaining the radius of curvature. This problem was overcome by isolating the hill and valley tips on which the measurements were performed.

Two sets of lines were produced to represent the included angle but only one set had to be measured.

The analysis time for a field is around 15 seconds.

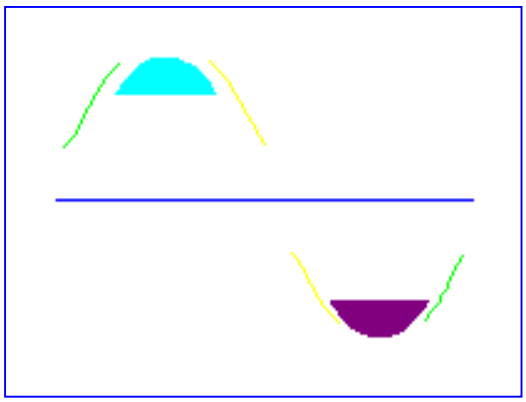

Figure 3: *Measurements were performed on the bitplanes shown above.*

Results Summary

(pixels)	*Height*	*Pitch*	*ROC*	*IA*
Top	657.42	988.30	123.58	73.13
Bottom	---	982.46	127.72	67.50

Equipment

Image Analysis System:	Clemex Vision SE
Calibration:	5.85 µm / pixel
Image Type:	B&W, Tiff (760x574)