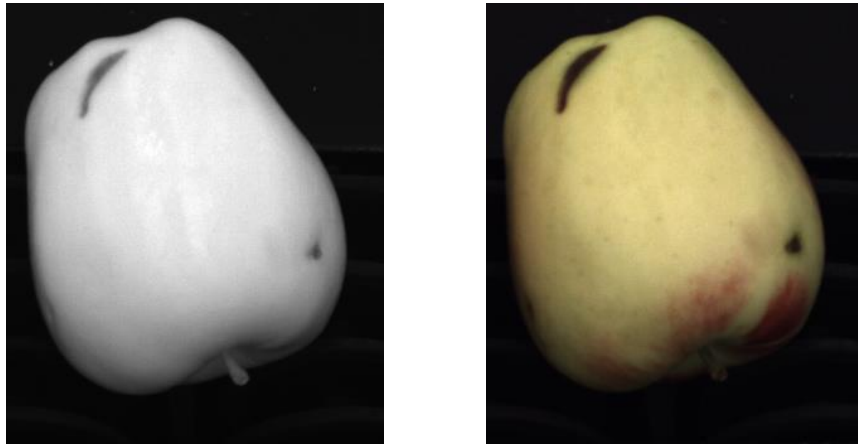# FRUIT INSPECTION

Students should develop a software system aimed at locating defects and imperfections on fruits. Each fruit is acquired through a NIR (Near Infra-Red) and a color camera with little parallax effect, as shown below:
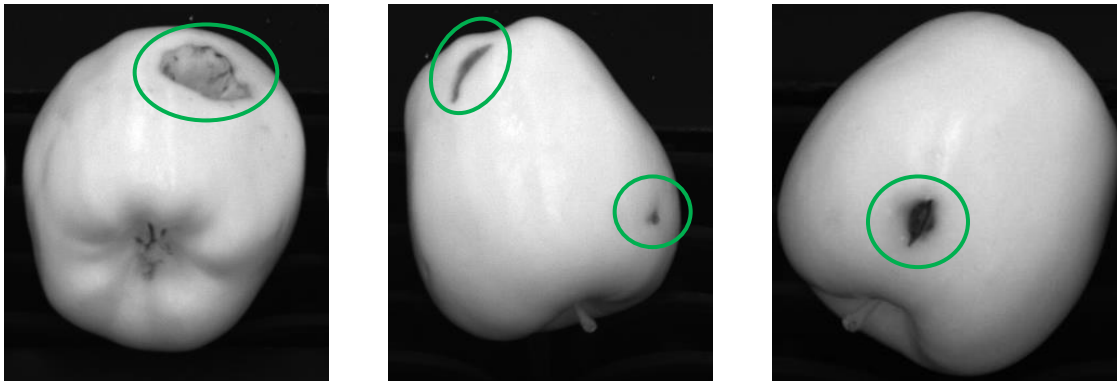

The image name format is *Cx_yyyyyy.bmp*, where *x* is 0 for the NIR images and 1 for the color images, while *yyyyyy* is the incremental number of the pair.

This project is proposed by UNITEC S.p.a. (http://www.unitec-group.com/, http://www.unisorting.com/).

FIRST TASK: FRUIT SEGMENTATION AND DEFECT DETECTION

Images in folder "first task" show three apples with clear external defects:
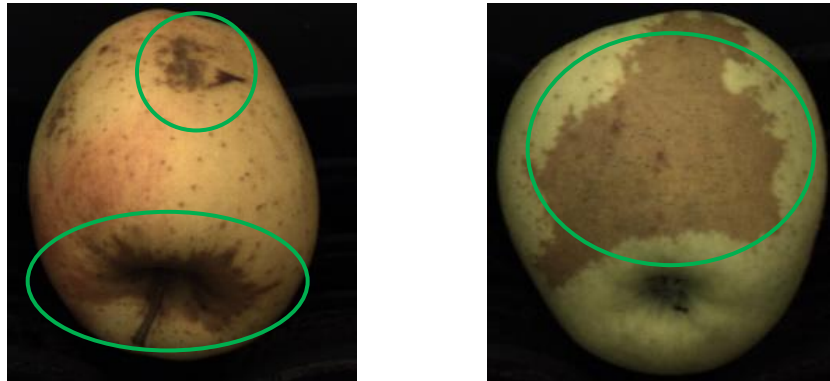

Students should:

- Outline the fruit by generating a binary mask
  HINT: first threshold the whole image in order to remove the background, but keeping intact the fruit borders; then fill the holes inside the fruit blob using a flood-fill approach. The image pair has little parallax, so a mask might be computed on one image and then applied on the other one.
- Search for the defects on each fruit
  HINT: the defects have strong edges, so edge extraction algorithm should help. Also, they usually exhibit a far darker color with respect to the neighboring areas of the fruit.

SECOND TASK: RUSSET DETECTION

Images in folder "second task" show two apples with an unwanted reddish-brown area:
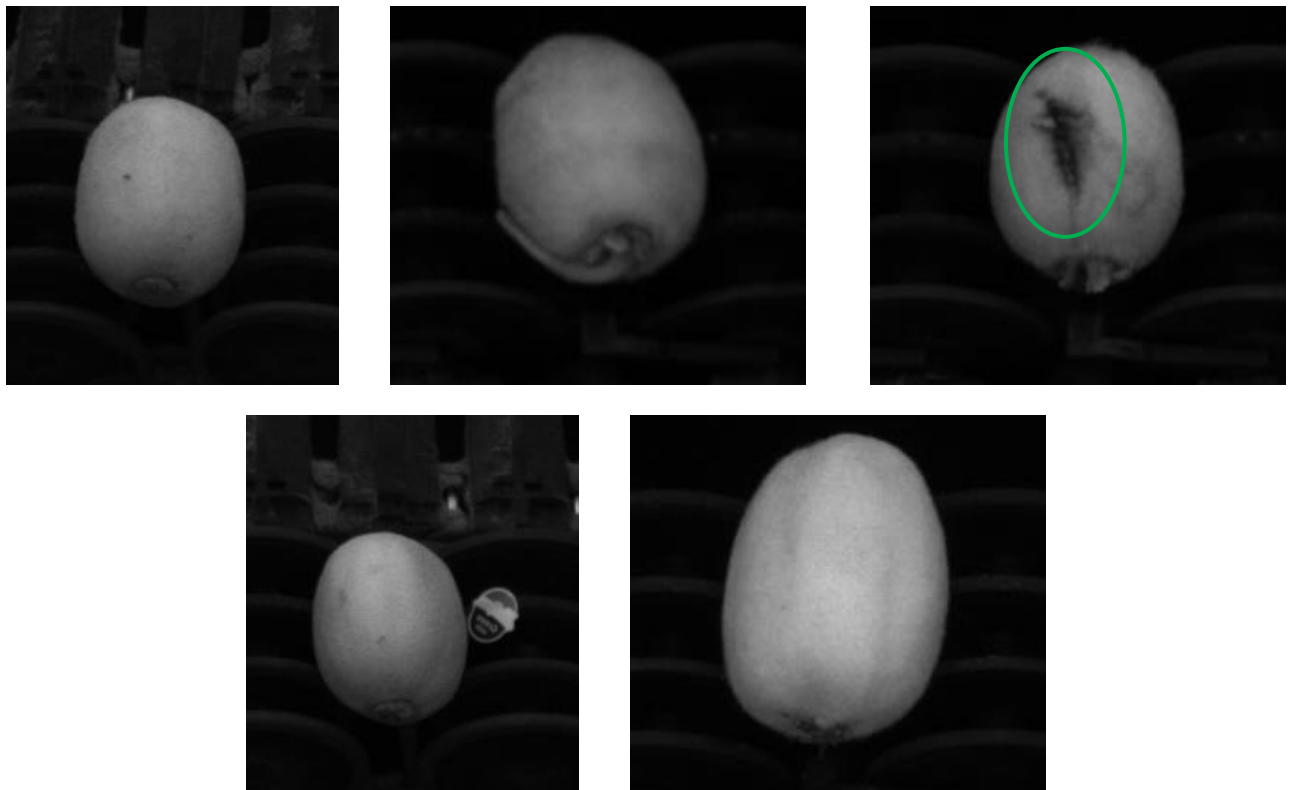

Students should identify the russet or at least some part of it with no false positive areas (if possible), in order to correctly classify the two fruits.

HINT: Find a suitable (Mahalanobis) color distance. Other color spaces, e.g. HSV, HSL, LUV, should be tried.

(OPTIONAL) FINAL CHALLENGE: KIWI INSPECTION

Images in folder "final challenge" show 5 kiwis:

Students should segment the fruits and locate the defect in image "000007". Special care should be taken to remove as "background" the dirt on the conveyor as well as the sticker in image "000006".