PRACTICAL ON MOMENT CALCULATIONS AND SECOND ORDER MOMENTS

- You are supplied with a moment calculation demonstration script, which contains examples of calculation of the zeroth-order, first order, and second order moments, and which demonstrates the use of binary image moments for estimating the location of the centroid of a region, and also directions of elongation (principal axes) of the region.

- Run the script, noting the existence of the "`pause`" commands, and gain an understanding of how it works. In particular, note how the moment calculations are performed. Note, also, how the eigenvectors of the second-order central moment matrix are estimated and displayed.

- Write a well-structured *Matlab* function that takes as arguments a binary image containing a connected component labelled image, and a label identifier, and returns the eigenvectors and eigenvalues corresponding to the second order central moment matrix of the region with label number matching that supplied.

- Using your function, try to improve the separation of the two types of rice (long grain – should be in red boxes, and the "risotto" rice – in blue boxes) in the script `peasandrice_not.m`. This script uses colour to separate the rice grains from the little pasta pieces, and uses area estimates to separate the two different types of rice grain, but does a poor job of it using region area alone (first and zero order moments). *Hint: the ratio between the second order moments provides an extra measurement that is more discriminative than the area of the grains, which is used in the supplied script*.

- In solving this problem, you should think about some way of estimating how well your algorithm works by drawing up a table containing number of rice grains of each type that are correctly identified as a ratio of total number of rice grains of each type, and try to **quantify** the performance improvements.