Lab 2: Intensity

This session covers exploratory tools for investigating intensity.
The lecturer's R script is available here (right click and save).

Exercise 1

The dataset `japanesepines` contains the locations of Japanese Black Pine trees in a study region.

1. Plot the `japanesepines` data.
2. Use the command `quadratcount` to divide the study region of the Japanese Pines data into a 3x3 array of equal quadrats, and count the number of trees in each quadrat.
3. Most plotting commands will accept the argument `add=TRUE` and interpret it to mean that the plot should be drawn over the existing display, without clearing the screen beforehand. Use this to plot the Japanese Pines data, and superimposed on this, the 3x3 array of quadrats, with the quadrat counts also displayed.
4. Use the command `quadrat.test` to perform the χ-square test of CSR on the Japanese Pines data.
5. Plot the Japanese Pines data, and superimposed on this, the 3x3 array of quadrats and the observed, expected and residual counts. Use the argument `cex` to make the numerals larger and `col` to display them in another colour.

Exercise 2

Japanese Pines, continued:

1. Using `density.ppp`, compute a kernel estimate of the spatially-varying intensity function for the Japanese pines data, using a Gaussian kernel with standard deviation $\sigma = 0.1$ units, and store the estimated intensity in an object `D` say.
2. Plot a colour image of the kernel estimate `D`.
3. Plot a colour image of the kernel estimate `D` with the original Japanese Pines data superimposed.
4. Plot the kernel estimate without the 'colour ribbon'.
5. Try the following command

   ```
   persp(D, theta=70, phi=25, shade=0.4)
   ```

   and find the documentation for the arguments `theta`, `phi` and `shade`.

Exercise 3

More Japanese Pines:

1. Compute a kernel estimate of the intensity for the Japanese Pines data using a Gaussian kernel with standard deviation $\sigma = 0.15$.

2. Find the maximum and minimum values of the intensity estimate over the study region. (Hint: Use `summary` or `range`)

3. The kernel estimate of intensity is defined so that its integral over the entire study region is equal to the number of points in the data pattern, ignoring edge effects. Check whether this is approximately true in this example. (Hint: use `integral`)