Overview

* All calculations must be done using R

Resources

In this problem set, we will again analyze the spatial patterns of healthy and diseased myrtle trees, which are infected with Myrtle Wilt. We’ll reuse the data files from problem set 6, which contain point patterns of the locations of healthy and diseased trees.

To fit point process models, we first need to convert the shapefiles to ppp format. The ‘ppm’ function doesn’t work on marked point patterns, so we also need to strip away the marks. The following code does those steps:

**library(raster)  
library(spatstat)  
library(maptools)**

**d <- shapefile("Diseased.shp")  
h <- shapefile("Healthy.shp")**

**d.unmarked <- unmark(as.ppp(d))  
h.unmarked <- unmark(as.ppp(h))**

Questions

1. Fit a point process model of a stationary Poisson process to each point pattern. What is the intensity of each point pattern? (2 points)
2. Consider the hypothesis that the density of trees of each type changes along an East-West gradient. For each point pattern, fit a point process model of a non-stationary Poisson process with an intensity function 𝜆 = 𝑒*a+bx.*For each point pattern, is the model better than the model you fit in Q1? (4 points)
3. Consider the hypothesis that the tree density is a non-linear function of the 𝑥 coordinate. For each point pattern, fit a point process model of a non-stationary Poisson process with an intensity function 𝜆 = 𝑒*a+bx+cx 2.*For each point pattern, is the model better than the model you fit in Q2? (4 points)

**Hints:**For non-stationary Poisson process models (e.g., questions 2 and 3), recall that the *logarithm*of the intensity is a linear function of any environmental covariates in the model. For a model with an intensity function such as 𝜆 = 𝑒*a+bx* (question 2), we can say that our point process model is log(𝜆)=a+bx. To fit this model, we simply include the x coordinate as the sole covariate in our ppm model. For question 3, you can specify this intensity function by using polynom(x,2) as the covariate in your ppm model.

Final submission

Please turn in two files: a doc or pdf file that contains both your answers and R output, and a .R file that contains your code. Your PDF or Word document should include any requested plots.