STAT 696, Spring 2011
Homework 5 Problems
due Thurs. March 3

2 Problems. Please follow the Lab report directions off the homework web page.

1. Consider the dataset `meuse` from Lab4 Variogram Model Fitting. We will consider `lead`.

(a) Repeat Example 1 from Lab4 using the `lead` data. Repeat Example 2 and fit a spherical variogram by eye and WLS using appropriate starting values. Compare the variogram model fit to the lead and with the variogram model fit to zinc (`lzn.fit1`).

(b) Compare the estimated spherical variogram model parameters fit to lead using the different fitting method options of 1,2,5,6,7.

2. Return to **Soil pH data**. Data on soil pH comes from an observational study in which samples of soil were collected at the nodes of a grid with 11 rows $\times$ 11 columns. The pH of the samples were measured in a laboratory.

The data is available off the class web page:

`http://www.rohan.sdsu.edu/~babailey/stat696/soilph.dat`

Use the R `read.table` command with the `header=T` option. (You do not need to make your own labels!)

(a) Compare the sample variogram when the trend is just the overall mean to when the trend is a 2nd order polynomial. Use the R function `variogram` in the `gstat` package to compute the two sample variograms assuming isotropy. Include the plots of the two sample variograms. Let $m(x, y) = \beta_0 + \beta_1 x + \beta_2 y + \beta_3 x^2 + \beta_4 xy + \beta_5 y^2$, for the 2nd order polynomial.

(b) Fit a spherical variogram model to the sample variogram using the 2nd order polynomial trend. Include a nugget effect. What are the estimated parameters. Plot the sample variogram and overlay the fitted model.

(c) Fit an exponential variogram model to the sample variogram using the 2nd order polynomial trend. Include a nugget effect. What are the estimated parameters. Plot the sample variogram and overlay the fitted model.

(d) Fit a Gaussian variogram model to the sample variogram using the 2nd order polynomial trend. Include a nugget effect. What are the estimated parameters. Plot the sample variogram and overlay the fitted model.

(e) Compare the model fits from (b)-(d). Which model fits the data "best"? Explain.