Exercise 4: Spatial Autocorrelation

**Due Dates:** Lab301: Nov. 28, 2005  
Lab302: Dec. 1, 2005

**Total Points:** 20

This assignment is divided into two parts. The first part is on spatial autocorrelation and spatial configuration; the second part is on the spatial autocorrelation and spatial resolution. The first part is to be completed manually. You need to include your calculations in the exercise report. The second part will be performed in the ARC/INFO GRID subsystem.

1. **Spatial Autocorrelation and Configuration of Spatial Data:**
   Assume that Figure 1 shows the layout of census tracks in a city. Table 1 contains the percentage of Italians in terms of total population of each track.

   ![Figure 1: Census Tracks and Their Respective IDs](image)

<table>
<thead>
<tr>
<th>Track ID</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

1) Compute both the Geary Index and Moran Coefficient to describe the spatial autocorrelation that might exist in the above spatial data set.

**QUESTION 1:** Would you think that the settlement of Italians in this city tend to be clustered? Why would you state so? (4 points)
2) Suppose during the data entry the data clerk entered the percentage wrong. Instead of typing 10, the person entered 100 for Census Track 1.

**QUESTION 2:** What impact would this mistake have on the Moran Coefficient? (you must recalculate the value for this index using the new percentage for Track 1). (4 points)

3) Suppose that the percentages for Track 1 (which is now 100) and Track 4 are exchanged.

**QUESTION 3:** What would be the impact of this exchange on the Moran Coefficient? (you must recalculate the value for this index) (4 points)

2. Spatial Autocorrelation and Spatial Resolution:

   The commands for calculating the Geary Index and Moran Coefficients in ARC/INFO GRID are: *geary* and *moran*, respectively. Use the ARC/INFO help system (enter `help` at the `Arc:` prompt) to learn more about these commands.

   There is a raster image of soil A horizon depth named `depth` in `S:\g579\lab04` directory. Use the ARC/INFO *copy* command to copy this file into your `lab04` workspace (you will first create `lab04` workspace on your thumb drive, move into the workspace and finally copy the image over).

   Use *geary* and *moran* to calculate the geary index and moran coefficient, respectively. Record the Moran Coefficient. Now use the GRID *aggregate* function (this is a function, not a command!) to reduce the spatial resolution of this image. Use the help system to find out how this *aggregate* function works.

   Once you know how to use the aggregation function, perform the followings:

   1) Reduce the spatial resolution of the image by a factor of 2 (cell factor of 2) with the aggregation type being MEAN, boundary handling method being EXPAND, and method for handling NODATA being DATA. You may want to name this new image (the image created from *aggregate*) after the original image name with the suffix of 2 such as `depth2`. This way you will be able to tell the reduction factor from the image name.

   2) Run *moran* on this new image and record the value of the Moran Coefficient.

   3) Increment the cell factor by 1 and repeat 1) and 2) with the new cell factor till the cell factor is greater than 16.

   **QUESTION 4:** Are the values of Moran Coefficient for these image the same? Explain why. Would decreasing spatial resolution ALWAYS result in a decreasing spatial autocorrelation? Why? (Show your results) (6 points)