

Geostatistics in the SPRING

Exercise 3

Course: Master of Science on Geospatial Technologies
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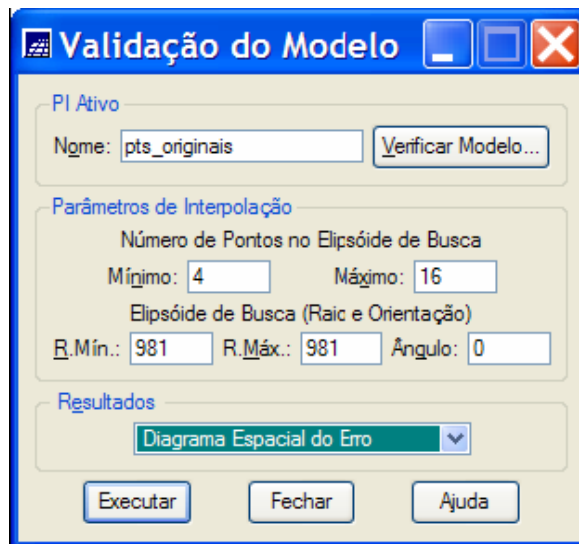
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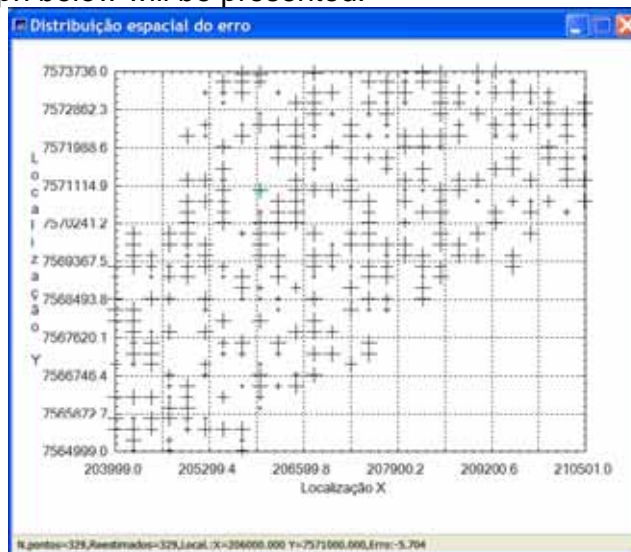
3 Modeling spatial variables considering isotropic behavior

3.6 Performing the crossvalidation for the isotropic model

- o Select, in the control panel, the *pts_originais* IL of the *Altimetria* category
- o In the **Analysis menu** of the SPRING, select **Geostatistics option** and, then, select the **Model Validation ... option**.



- o Clicking on the **button** Model Verification... it is possible to verify, to input or to change the values that will be used as parameters for the structural model of the semivariogram to be validated.
- o Define the Interpolation Parameters filling out the **fields Minimum** equal 4, **Maximum** equal 16, **R. Min** and **R. Max** equal to 981 and **Angle** equal 0 (anisotropic)
- o Click on the **button** Apply of this window and, then, select as **Results: Error Spatial Diagram**. The graph below will be presented.

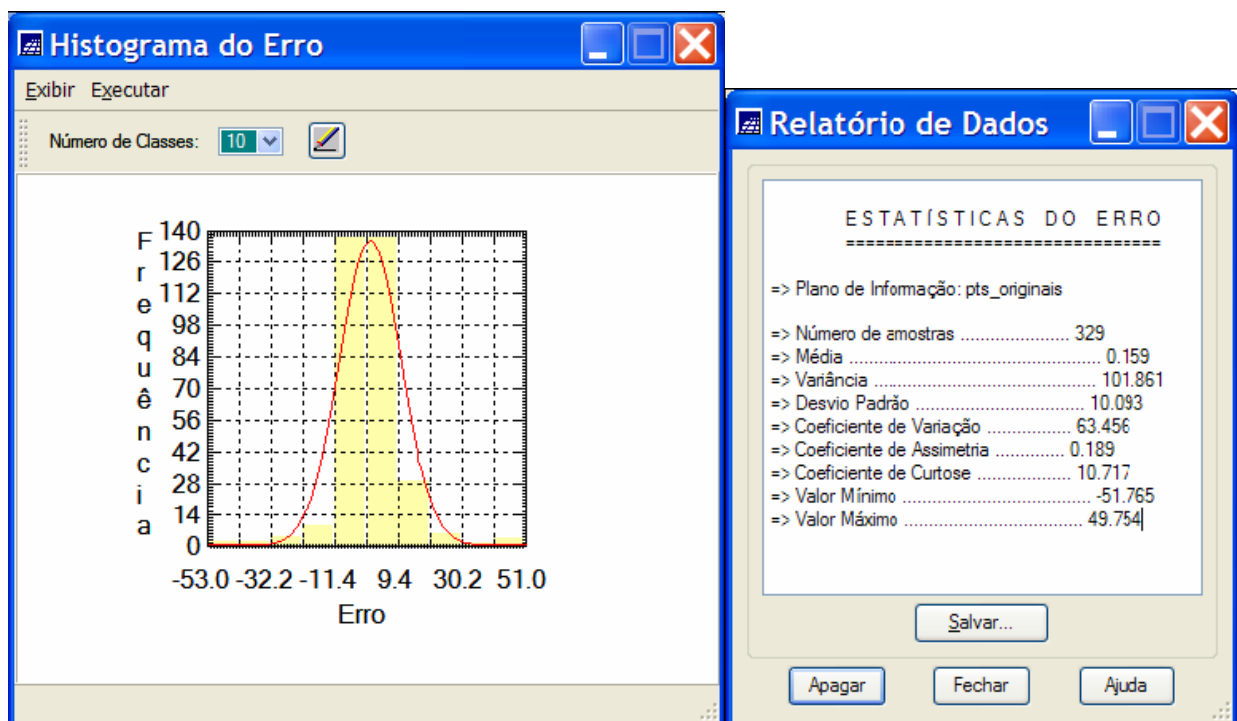


o Observe in this graph that the size of the + signals of the diagram are proportional to the estimated local error value related to the observed values. Click on any of this signal to get quantitative information about each individual error.

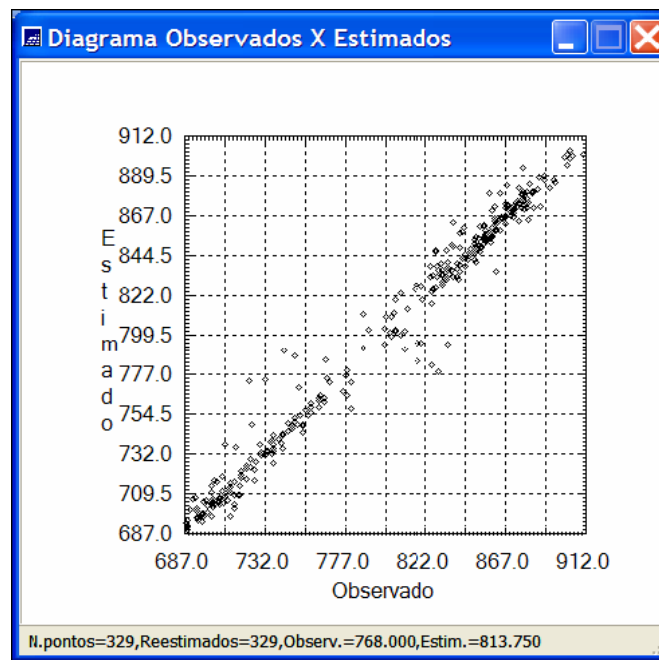
o Select *Histogram of Error* as the **Results**, in the Model Validation window, in order to show the graph of the error distribution. The Number of Classes, used to define the intervals for the histogram display can be changed to a different value. To display the histogram after choosing different number of classes click on the **draw button**.

o A numerical report displaying a summary of statistic of the errors can be obtained selecting the *Statistics of Error* in the **Results options** of the Model Validation window.

o Observe, in the figures below, the shape of the probability distribution functions (simetric? Gaussian?), the mean value of the errors (closer to 0 indicate non bias), the standard deviation (measure of global error?) and other statistic information.



- o Select, in the Model Validation window, as an **option** of Results : Observed Diagram x Estimated, in order to display the scatter plot of the estimated values against the observed values of the IL pts_originais. Check the correlation between these two information and the presence of outliers in this graph.



- o Select the **Numerical option**, in the Results area of the Model Validation window, to get a numerical report showing the values used to plot the scatter plot above.
- o Click on the **Save... button**, of the Data Report window, if you want to save those information in a text file in your computer.

Infolayer: pts_originais

7 = Number of Variables
 X Localization
 Y Localization
 Z Localization (not used)
 Observed
 Estimated
 Variance Estimation
 Error = Estimated - Observed

209750.000	7571250.000	0.000	698.000	697.951	118.868	-0.049
208750.000	7571250.000	0.000	702.000	713.862	83.959	11.862
209750.000	7573000.000	0.000	695.000	693.857	73.772	-1.143
210250.000	7571750.000	0.000	703.000	701.980	68.824	-1.020
210250.000	7572250.000	0.000	700.000	698.284	86.906	-1.716
210250.000	7571500.000	0.000	702.000	702.881	73.932	0.881
210250.000	7572500.000	0.000	697.000	697.790	63.067	0.790
210000.000	7571750.000	0.000	689.000	693.846	80.076	4.846
209250.000	7573250.000	0.000	690.000	700.420	75.857	10.420
208500.000	7573720.000	0.000	703.000	706.316	84.345	3.316
210000.000	7572750.000	0.000	689.000	691.180	67.712	2.180

Buttons: Salvar..., Apagar, Fechar, Ajuda

3.7 Estimating numeric grids using ordinary kriging

- Select, in the control panel, the IL *pts_originais* of *Altimetria* category.
- In the **Analysis menu** of SPRING, choose the **Geostatistics option** and, then, select the **Kriging... option**
- In the Kriging window:
 - Click on the **button Model Verification** to check, or edit, the parameter values of the variogram model that was defined for the current sample set.
 - Select as a **Kriging type** the *Ordinary option*.
 - For the grid parameters keep the same **bounding box** of the project and the default values for resolutions X and Y (**ResX** and **ResY**). The default values will create a grid in the entire project area with 200 rows x 200 columns.
 - Fill out the **fields** related to the Interpolation Parameters as: **Minimum:** equal 4 and **Maximum** equal 16 (this parameters define the Minimum and Maximum number of the closest points that will be considered in the interpolation). **R. Min** and **R. Max** must be equal 981 (these parameters are related to the search ellipsoid that determine the influence area of each point to be interpolated. The values are equal because the attribute variation in space is been modeled as isotropic). The **Angle field** can be filled out with value 0 (or other because the attribute variation is considered isotropic)
 - Choose the *Altimetria* category clicking on the **Category... button**.
 - Fill out the **InfoLayer field** with the name: *krig_ord_pts_origin*.
 - Click on the **Apply button** to finally run the ordinary kriging.

Krigeagem

PI Ativo
Nome: pts_originais Verificar Modelo...

Krigeagem
Tipo: Ordinária Média:

Definição de Grade
Res. X: 35.000000 Res. Y: 50.000001
Retângulo Envolvente...

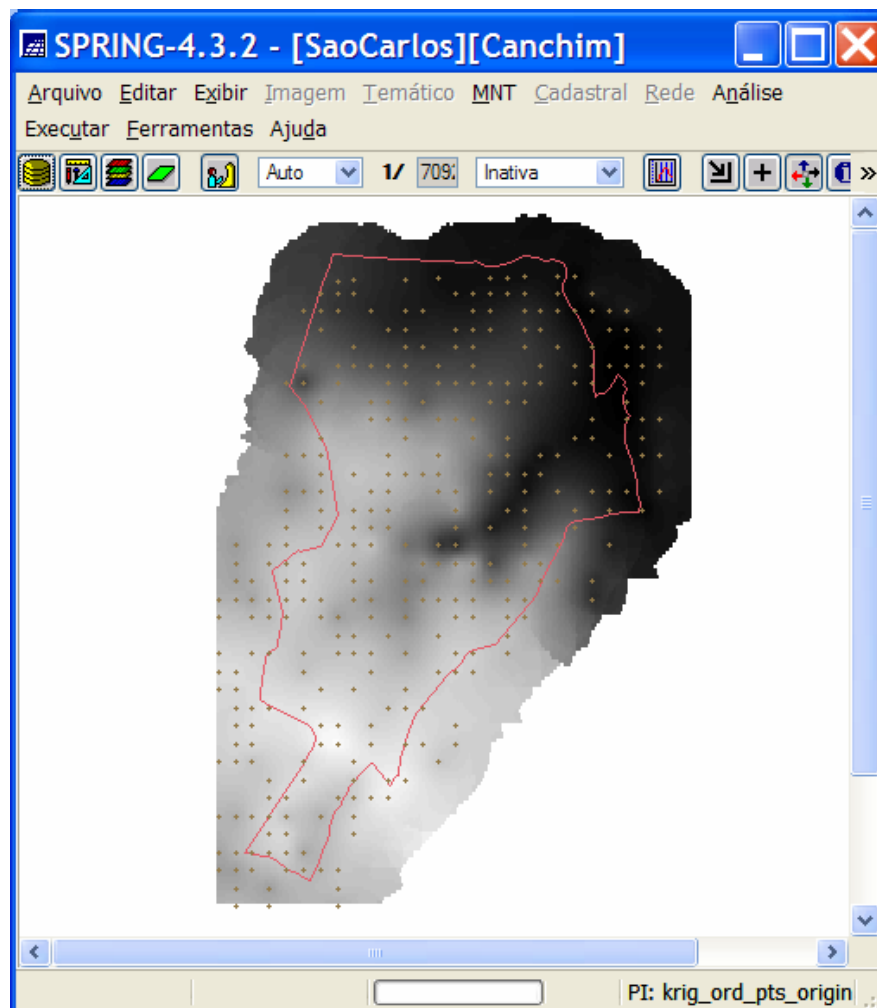
Parâmetros de Interpolação
Número de Pontos no Elipsóide de Busca
Mínimo: 4 Máximo: 16
Elipsóide de Busca (Raio e Orientação)
R. Mín.: 981 R. Máx.: 981 Ângulo: 0

Saída
Categoria... Altimetria
Plano de Informação: krig_ord_pts_origin

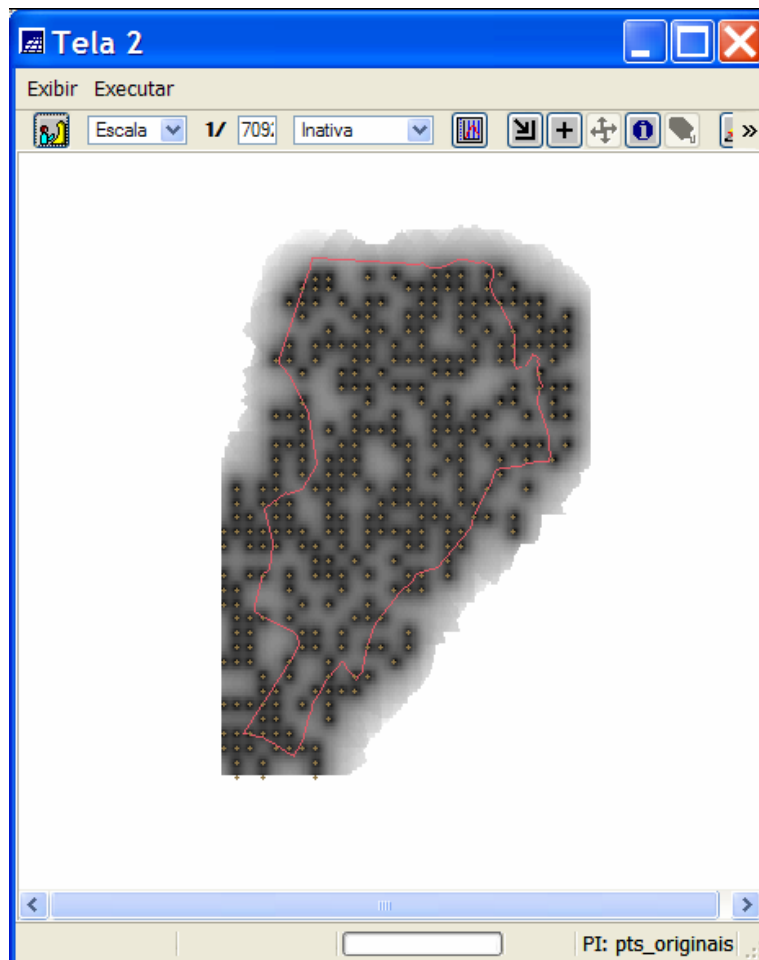
Executar Fechar Ajuda

3.8 Displaying the results in the main graphic display of the SPRING

- Displaying the map of estimates evaluated by ordinary kriging
- In the Control Panel
 - Enable the **Display 1**
 - Select in the list of **Categories**: *Altimetria*
 - Select in the list of **Infolayers** : *krig_ord_pts_origin*
 - Select as representation: *Imagem*
 - Select also the *lines* of the Infolayer *recorte* of the *Limites* category
 - Select also the *samples* of the Infolayer *pts_originais* of the *Altimetria* category.
 - Click on **button de Draw**
- The figure below show the results of the display tasks suggested above. It can be seen the numerical grid evaluated by the ordinary kriging superposed by the elevation samples and the boundaries of the Canchim farm.



- Displaying the map of variance of the estimates evaluated by ordinary kriging
- In the Control Panel
 - Enable and Show the **Display 2**
 - Select in the list of **Categories**: *Altimetria*
 - Select in the list of **Infolayers** : *krig_ord_pts_origin_KV*
 - Select as representation: *Imagem*
 - Select also the *lines* of the Infolayer *recorte* of the *Limites* category
 - Select also the *samples* of the Infolayer *pts_originais* of the *Altimetria* category.
 - Click on **button** de **Draw**
- The figure below show the results of the display tasks suggested above. It can be seen the numerical grid of the variances evaluated by the ordinary kriging superposed by the elevation samples and the boundaries of the Canchim farm.



- Perform a visual analysis on the results obtained in the two maps above posted. Consider the quality of the estimator and the spatial distribution of the kriging variance. What is opinion about this distribution? Compare the results above with the results of deterministic procedures used to estimate spatial attributes.