Geostatistics in the SPRING Exercise 6

Course: Master of Science on Geospatial Technologies Professor: Carlos A. Felgueiras

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6. Assesment of local uncertainty of categorical variables with indicator

geostatistics

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- 6.7. Visualizing the results in the main graphical display of the SPRING
- 6.8. Cutting out and visualizing the indicator kriging resulting maps

6.1 Importing and displaying the soil texture sample data

- Activate (Apply) SaoCarlos database
- Activate (Load) Canchim project
- Creating a category of a DTM model

Select the Data Model... option from the File menu of the SPRING
 In the Data Model window

- Fill out the **Name field** with: *TexturaMnt*
- Choose from options of Models : DTM

🖉 Data Mod	el	
Categories		
Altimetria		Visual
Limites TexturaNumerica		Attributes
TexturaTematica		
Name: TexturaNo	umerica Table:	CG000004
Models		
C Image	🔘 Cada	estral
OTM	O Netw	vork
C Thematic	O Non-	Spatial
C Object		
Create	Change	Delete
Thematic Classes		
		Visual
		Attributes
		Data
Name:	Table:	CR
Create	Change	Delete
Apply	Close	Help

- o Click on the Create button to create the category
- o Click on the Apply button
- o Click on the **Close button** to quit the Data Models window

- Importing the data of soil texture of the Canchim region
 - o Select option Import... from the File menu of the SPRING,
 - o Click on the Directory... button
 - In the Directory window
 - O Select as Directory: c:\curso_geoest e click on the OK button
 - Select as Format: ASCII-SPRING
 - Select as File: textura_solo.spr
 - Select as Entity: Sample(DTM)
 - Select as **Unity**: *m* (meters)
 - o Define for the Scale value: 10000
 - o Define the values Res. X: 35 and Res. Y: 50
 - o Keep current values for Projection and Bounding Box of the project.
 - o Keep the current Project Name (Canchim)
 - o Click on Categories... button
 - o In the Category window
 - o Choose Category TexturaNumerica
 - o Click on the Apply button
 - Fill out the field IF (Info Layer) with the name: textura_solo
 - Click on the **Apply button**

	🖬 Import 📃 🗖 🔀
	External Data Directory C:\curso_geoest\ CR Format: ASCII-SPRING
	pontos-semtendencias.spr pontos_originais.spr recorte_canchim_L2D.spr recorte_canchim_LAB.spr textura_solo.spr
spring Look in: C:/curso_gecest/ ← È ☆ III III	Entity.: Sample (DTM) Unit: m Scale:1/ 10000 Res.: X: 35.00000000(Y: 50.0000000(Projection UTM/Hayford Bounding Box
springdb50	SPRING Project: Canchim Category Textura Numerica Object Infolayer: textura_solo
Directory: QK File type: Directories Cancel	Execute Close Help

o Quit the import window clicking on the Close button

- Importing the data texts of soil texture of the Canchim region
 - o Select option Import... from the File menu of the SPRING,
 - o Click on the Directory... button
 - In the Directory window
 - Select as **Directory**: c:*curso_geoest* e click on the **OK button**
 - Select as Format: ASCII-SPRING
 - Select as File: textura_solo_tex.spr
 - Select as Entity: Text
 - Select as **Unity**: *m* (meters)
 - o Define for the Scale value: 10000
 - o Define the values Res. X: 35 and Res. Y: 50
 - Keep current values for Projection and Bounding Box of the project.
 - Keep the current Project Name (Canchim)
 - o Click on Categories... button
 - o In the Category window
 - o Choose Category TexturaNumerica
 - o Click on the Apply button
 - o Fill out the field IF (Info Layer) with the name: textura_solo
 - Click on the **Apply button**

	🗖 Import
	External Data Directory C:\curso_geoest\ CR Format: ASCII-SPRING
	pontos-semtendencias.spr pontos_originais.spr recorte_canchim_L2D.spr recorte_canchim_LAB.spr textura_solo.spr textura_solo_tex.spr
🖩 spring	Entity.: Text Unit: m Scale:1/ 10000
Look in: 🔄 C:/curso_gecest/	Projection UTM/Hayford Bounding Box
ia ia springdb ia springdb50	SPRING Project: Canchim Category Textura Numerica Object Infolayer: textura_solo
Directory: QK File type: Directories Cancel	Execute Close Help

o Quit the import window clicking on the Close button

- Visualizing the data and texts of soil texture of the Canchim region
 - $\circ~$ In the Control Panel
 - Activate the Display 1
 - Select in the Category list: Limites
 - Select in the InfoLayer list: recorte
 - Select as representation Lines
 - Select in the Category list: TexturaNumerica
 - Select in the InfoLayer list: textura_solo
 - Select as representations: Samples and Text

🗷 Contro 📃 🗖 🔀	🗷 Contro 📃 🗖 🔀
Categories	Categories
() Altimetria	() Altimetria
(V) Limites	(V) Limites
() TexturaNumerica	(V) TexturaNumerica
J	
Infolayers V	Infolayers V
(L) recorte	(AT) textura_solo
	()textura_solo_shan 📃
	() textura_soloik
J	()textura_soloik_Inc
Priority: 200 CR	Priority: 300 CR
Points Classes	Samples 🔽 Isolines
🔽 Lines 🖵 Text	🔽 Grid 🔽 Text
F Raster	🖵 TIN 🦵 Image
Select Query	Select Query
- Display Control	- Display Control
Enable: 🖲 1 🔿 2 🔿 3 🔿 4 🔿 5	Enable: ● 1 ○ 2 ○ 3 ○ 4 ○ 5
Show: 🔽 2 🗔 3 🗔 4 🗔 5	Show: 🔽 2 🗔 3 🗔 4 🗔 5
Attach: 🔽 2 🗔 3 🗔 4 🗔 5	Attach: 🔽 2 🗔 3 🗔 4 🗔 5
Zoom: 🖲 1 🔿 2 🔿 4 🔿 8	Zoom: @ 1 C 2 C 4 C 8
Close Help	Close Help

• Click on the Draw Icon I of the Control Panel or of the SPRING tool bar

- SPRING-4.3.3 (25/10/2007) -[SaoCarlos][Canchim] File Edit View Image Thematic DTM Cadastral Network Analysis Execute Tools Help 12 🦉 82 1/ 5000 Auto N Ы ÷ Ô • Inactive • <mark>9</mark> » ٤. * 4 • IL: textura_solo
- The Figure below illustrates the results of the visualization operations above done

- Applying the nearest neighbor interpolation to the soil texture data
 - o Select the InfoLayer textura_solo in the Control Panel of the SPRING

• Select **option Rectangular Grid Generation...** from the **DTM** option of the SPRING menu.

- In the Grid Generation window
 - Select as Input: Sample
 - Keep as **Output**: *textura_solo*
 - Keep the values Resolution X: 35 and Y: 50
 - o Select as Interpolator: Closest Neighbor
 - o Keep as **Radius:** *2441.31*
 - o Click on the Apply button to run the Grid Generation function

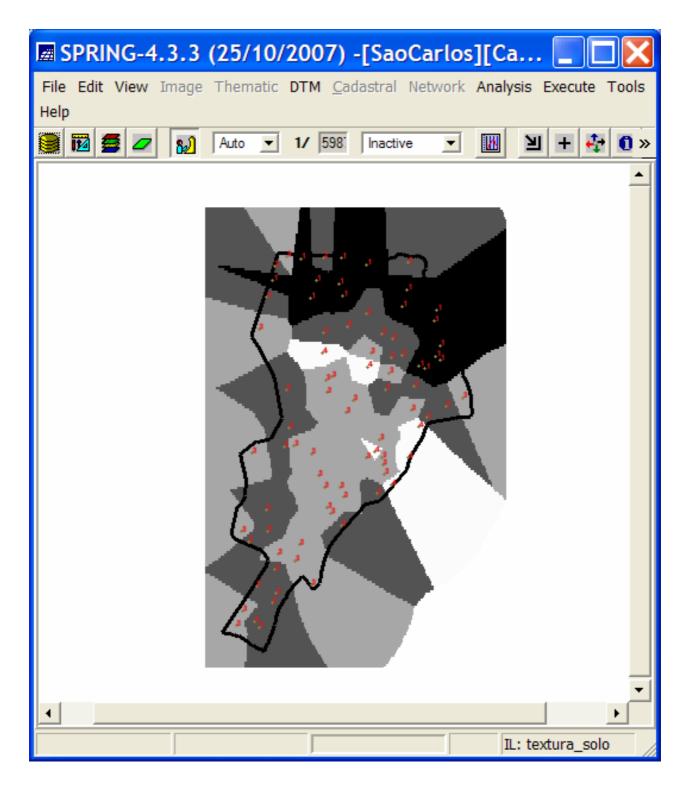
🖩 Grid Generation 🛛 🔲 🔀
Input: Sample C Grid C TIN Output Layer: textura_solo
Bounding Box Resolution: X: 35.000000 Y: 50.000000
Interpolator: Closest Neighbor
Pow: 2 💌 Radius: 2441.311123
Apply Close Help

- Visualizing the data and texts of soil texture of the Canchim region
 - $\circ~$ In the Control Panel
 - Activate the Display 1
 - Select in the Category list: Limites
 - Select in the InfoLayer list: recorte
 - Select as representation Lines
 - Select in the Category list: TexturaNumerica
 - Select in the InfoLayer list: textura_solo
 - Select as representations: Samples, Image and Text

🗷 Contro 📃 🗖 🔀	🗷 Contro 📃 🗖 🔀
Categories	Categories
() Altimetria	() Altimetria
(V) Limites	(V) Limites
() TexturaNumerica	(V) TexturaNumerica
J	
Infolayers V	Infolayers V
(L) recorte	(AlmT) textura_solo
	()textura_solo_shan
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	() textura_soloik_Inc
Priority: 200 CR	Priority: 300 CR
F Points F Classes	Samples 🔽 Isolines
🔽 Lines 🖵 Text	🖵 Grid 🔽 Text
F Raster	🗖 TIN 🔽 Image
Select Query	Select Query
- Display Control	-Display Control
Enable: ● 1 ○ 2 ○ 3 ○ 4 ○ 5	Enable: 🖲 1 🔿 2 🔿 3 🔿 4 🔿 5
Show: 🔽 2 🗔 3 🗔 4 🗔 5	Show: 🔽 2 🗔 3 🗔 4 🗔 5
Attach: 🔽 2 🗔 3 🗔 4 🗔 5	Attach: 🔽 2 🗔 3 🗔 4 🗔 5
Zoom: ● 1 ○ 2 ○ 4 ○ 8	Zoom: 1 C 2 C 4 C 8
CloseHelp	Close Help

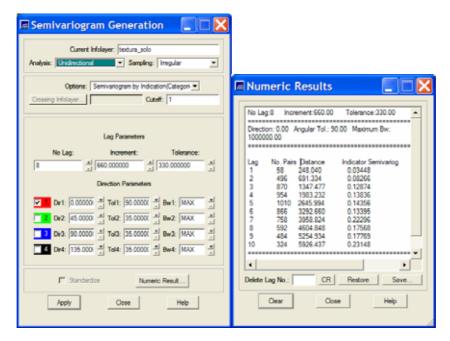
• Click on the Draw Icon of the Control Panel or of the SPRING tool bar

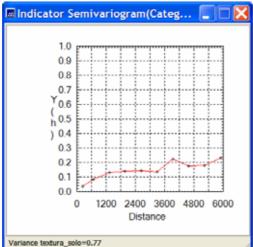
• The Figure below illustrates the results of the visualization operations above done



6.2 Generating and fitting variograms for the first cutoff (class 1)

- Select the textura_solo InfoLayer of the TexturaNumerica Category
- Click on the *Semivariogram Generation* option of the Geostatistics of the Analysis SPRING menu to open the semivariograma generation window.
- In the Semivariogram Generation window
 - Select Unidirectional as Analysis:, Irregular as Sampling: and Semivariogram by Indication (Category) as Options:.
 - Fill out the Cutoff text field with the value equal 1.
 - Select, as Lag Parameters, No Lag: equal 8, Increment 660 and Tolerance 330
 - Select as Direction Parameters the number 1 (0 degrees, omnidirectional variogram)
 - Click on the Apply button to display the respective experimental semivariogram
 - Click on the *Numeric Result...* button to show the Numeric Results window that contains tabular information related to the experimental semivariogram





- Click on the *Semivariogram Modeling* option of the Geostatistics of the Analysis SPRING menu to open the Semivariograma Modeling window.
- In the Semivariogram Modeling window
 - o Select Automatic as Adjusting option
 - Select 1 for the Number of Structures option
 - o Select Model 1: Exponential as the Models option
 - Click on the *Apply* button and then click on the *textura_solo_0.var* option of the Adjust Verification list to display the Fit Model and Data Report windows.

Semivariogram	
 Automatic Visual 	🖩 Fit Model = Exponential
Number of Structures 1 2 3 Models Model 1: Exponential Model 2: Spherical Image: Construction Adjust Vgrification Image: Construction Image: Construction Model Parameters Define Aplly Close Help	2.546e-001 2.292e-001 2.037e-001 1.782e-001 1.782e-001 1.1273e-001 1.1273e-001 1.1273e-001 1.1019e-001 7.639e-002 5.093e-002 2.546e-002 3.469e-017 0 1200 2400 3600 4800 6000 Distance

🗷 D	ata Report				
	AJUSTE D	O SEMIVA	RIOGRAMA		•
\o 1	umário: Arquivo: C: urso_geoest\springdl No. de variáveis: 3 No. de Lags: 10 No. de Lags usados:		nchim/GeoStatisti	c/textura_solo_0.var	
	arâmetros iniciais: Efeito Pepita (Co): Para modelo transitiv Contribuição (C1): Alcance (a): 2963.2 odelo de Semivariogra	o: Exponencial 0.187 19			
N	o. Akaike	Efeito Pepita	Contribuição	Alcance	
	1 -33.572 2 -33.924 3 -33.953	0.004 0.005 0.006	0.174 0.177 0.178	3596.346 3984.448 4149.112	-
			Save		
	Clear		Close	Help	

- o Click on the Define... button to open the model parameters window
- In the Model Parameters window

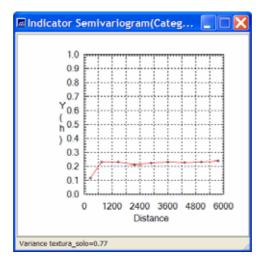
- Choose Number of Structures equal 1
- Fill out the Nugget Effect text field with the value .006
- For the First Structure options
 - Choose Type: equal Exponential
 - Fill out the Contribution field with value .178
 - Fill out the Anis. Angle with value 0
 - Fill out the Max. and Min. Range fields with value 4149.11
- Click on the *Apply* button to store the above model parameters

Model Par	amet	ers 📘	
<u>Parameters</u> Number of Stru		100	C 2
	Effect: .0		3
-First Structure			
Туре:	Expone	ential 💌	
Contribution:	.178	Anis. Angle:	: 0
Max. Range:	4149.11	Min. Range:	4149.11
Second Structure			
Туре:	Spheric	al 🔻	
Contribution:		Anis, Angle:	
Max. Range:		Min. Range:	
-Third Structure			
Туре:	Spheric	al 🔻	
Contribution:		Anis. Angle:	
Max. Range:		Min. Range:	
Apply	Close		Help

6.3 Generating and fitting variograms for the second cutoff (class equal 2)

- Select the textura_solo InfoLayer of the TexturaNumerica Category
- Click on the *Semivariogram Generation* option of the Geostatistics of the Analysis SPRING menu to open the semivariograma generation window.
- In the Semivariogram Generation window
 - Select *Unidirectional* as Analysis:, *Irregular* as Sampling: and *Semivariogram by Indication (Category)* as Options:.
 - Fill out the Cutoff text field with the value equal 2.
 - Select, as Lag Parameters, No Lag: equal 7, Increment 725 and Tolerance 362.5
 - Select as Direction Parameters the number 1 (0 degrees, omnidirectional variogram)
 - Click on the Apply button to display the respective experimental semivariogram
 - Click on the Numeric Result... button to show the Numeric Results window that contains tabular information related to the experimental semivariogram.

Semivariogram Generation	
Current Infolayer: [textura_solo	
Analysis: Unidirectional 💌 Sampling: Irregular 💌	🖪 Numeric Results
Options: Semivariogram by Indication/Categori Crossing Infolayer Cutoff: 2	No Lag:7 Increment:725.00 Tolerance:362.50
Lag Parameters	Direction: 0.00 Angular Tol.: 90.00 Maximum Bw: 1000000.00
No Lag: Increment: Tolerance: 7 # 725.00000 # 362.500000 #	Lag No. Pairs Distance Indicator Semivariog 1 70 266.216 0.11429 2 600 766.114 0.22833 3 984 1472.517 0.23069
Direction Parameters Dr1: 0.000000 at Tel1: 50.000000 at Ew1: MAX at Ew1:	4 1064 2179.605 0.21053 5 1064 2891.403 0.22368 6 894 3614.471 0.23154 7 722 4328.020 0.22576
Dv2: 45 0000 ± Tol2: 35 0000 ± Bw2: MAX ± 3 Dv3: 90.0000 ± Tol3: 35 00000 ± Bw3: MAX ±	8 580 5050.122 0.23103 9 388 5778.236 0.23711
De4: 135.000	Delete Lag No.: CR Restore Save
Apply Close Help	Clear Close Help



- Click on the *Semivariogram Modeling* option of the Geostatistics of the Analysis SPRING menu to open the Semivariograma Modeling window.
- In the Semivariogram Modeling window
 - Select Automatic as Adjusting option
 - Select 1 for the Number of Structures option
 - Select Model 1: Exponential as the Models option
 - Click on the *Apply* button and then click on the *textura_solo_0.var* option of the Adjust Verification list to display the Fit Model and Data Report windows.

🗷 Semivariogram 📃 🗖 🔀	
Adjusting Image: Constraint of the second secon	Fit Model = Exponential
Apily Close Help	Distance

	a Report	0.058004	BLOCBANA	L. L.	
	AJUSTE D	O SEMIVA	RIOGRAMA		
\curso No. (No. (ivo: C:		nchim/GeoStatistic,	Atextura_solo_0.var	
Efeit	etros iniciais: to Pepita (Co): a modelo transitiv	0.054 p: Exponencial			
Con Alca	tribuição (C1): ance (a): 2889.1 o de Semivariogra	0.178 18			
Con Alca	tribuição (C1): ance (a): 2889.1	0.178 18 ama Exponencial	Contribuição	Alcance	
Con Alca Modek No. 1 2	tribuição (C1): ince (a): 2889.1 o de Semivariogra Akaike 	0.178 18 ama Exponencial Efeito Pepita 0.054 0.054	 0.178 0.178	2889.118 2889.118	
Con Alca Modek No. 1	tribuição (C1): ince (a): 2889.1 o de Semivariogra Akaike 	0.178 18 ama Exponencial Efeito Pepita 0.054	0.178 0.178 0.172	2889.118	×
Con Alca Modek No. 1 2	tribuição (C1): ince (a): 2889.1 o de Semivariogra Akaike 	0.178 18 ama Exponencial Efeito Pepita 0.054 0.054	 0.178 0.178	2889.118 2889.118	•

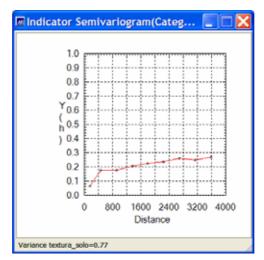
- o Click on the Define... button to open the model parameters window
- o In the Model Parameters window
 - Choose Number of Structures equal 1
 - Fill out the Nugget Effect text field with the value .054
 - For the First Structure options
 - Choose Type: equal Exponential
 - Fill out the Contribution field with value .172
 - Fill out the Anis. Angle with value 0
 - Fill out the Max. and Min. Range fields with value 1147.64
 - Click on the Apply button to store the above model parameters

🖩 Model Parameters 📃 🗖 🔀					
Parameters					
Number of Structures: 🖲 1 🔿 2 🔿 3					
Nugget Effect: 0.054					
-First Structure					
Type: Exponential 💌					
Contribution: .172 Anis. Angle: 0					
Max. Range: 1147.64 Min. Range: 1147.64					
Second Structure					
Type: Spherical 💌					
Contribution: Anis. Angle:					
Max. Range: Min. Range:					
Third Structure					
Type: Spherical 💌					
Contribution: Anis. Angle:					
Max. Range: Min. Range:					
Apply Close Help					

6.4 Generating and fitting variograms for the third cutoff (class equal 3)

- Select the textura_solo InfoLayer of the TexturaNumerica Category
- Click on the *Semivariogram Generation* option of the Geostatistics of the Analysis SPRING menu to open the semivariograma generation window.
- In the Semivariogram Generation window
 - Select *Unidirectional* as Analysis:, *Irregular* as Sampling: and *Semivariogram by Indication (Category)* as Options:.
 - Fill out the Cutoff text field with the value equal 3.
 - Select, as Lag Parameters, No Lag: equal 7 Increment 450 and Tolerance 225
 - Select as Direction Parameters the number 1 (0 degrees, omnidirectional variogram)
 - Click on the *Apply* button to display the respective experimental semivariogram
 - Click on the *Numeric Result...* button to show the Numeric Results window that contains tabular information related to the experimental semivariogram.

Semivariogram Generation	
Current Infolayer: [textura_solo Analysis: Unidirectional	
Options: Semivariogram by Indication/Categori Crossing Infolgyer Cutoff: 3	Mumeric Results
Lag Parameters No Lag: Increment: Tolerance: 7 a [#50.000000] a) [225.000000] a) Drection Parameters Image: Image: <td>No Lag:7 Increment:450.00 Tolerance:225.00 Direction: 0.00 Angular Tol.: 90.00 Maximum Biv: 1000000.00 Lag No. Pairs Distance Indicator Semivating 1 16 165.552 0.06250 2 264 473.221 0.17424 3 432 919.653 0.17993 4 584 1365.520 0.20344 5 664 175.355 0.2289 6 662 2252.063 0.22877 8 626 3142.750 0.24760 9 554 3955.021 0.26715 Delete Lag No.: CR Restore Sarve</td>	No Lag:7 Increment:450.00 Tolerance:225.00 Direction: 0.00 Angular Tol.: 90.00 Maximum Biv: 1000000.00 Lag No. Pairs Distance Indicator Semivating 1 16 165.552 0.06250 2 264 473.221 0.17424 3 432 919.653 0.17993 4 584 1365.520 0.20344 5 664 175.355 0.2289 6 662 2252.063 0.22877 8 626 3142.750 0.24760 9 554 3955.021 0.26715 Delete Lag No.: CR Restore Sarve
Apply Close Help	Oear Occe Help



- Click on the *Semivariogram Modeling* option of the Geostatistics of the Analysis SPRING menu to open the Semivariograma Modeling window.
- In the Semivariogram Modeling window
 - Select Automatic as Adjusting option
 - Select 1 for the Number of Structures option
 - Select Model 1: Exponential as the Models option
 - Click on the *Apply* button and then click on the *textura_solo_0.var* option of the Adjust Verification list to display the Fit Model and Data Report windows.

🗷 Semivariogram 📃 🗖 🔀	
Adjusting	
Automatic C Visual	🖩 Fit Model = Exponential
Number of Structures	
© 1 C 2 C 3	2.939e-001 providence of the second s
Models-	2.645e-001
Model 1: Exponential	2.351e-001
Model 2: Spherical	2.057e-001
Model 3: Spherical	Y 1.763e-001
	1.469e-001
Adjust Verification	h 1.459e-001
textura_solo_0.var	·
	8.816e-002
	5.877e-002
Model Parameters	2.939e-002
Define	2.776e-017 Eiiiiiiiii-
	0 800 1600 2400 3200 4000
Aplly Close Help	Distance

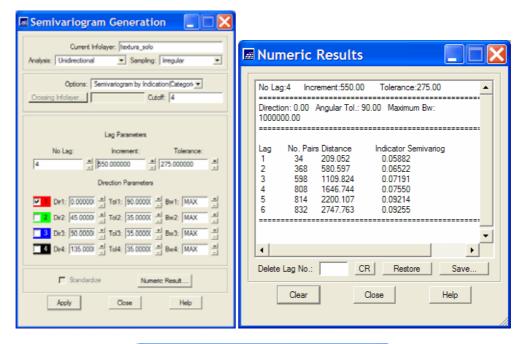
Data Repor	È				
AJUSTE	DO SEMIVA	RIOGRAMA		_	
Sumário: Arquivo: C: \curso_geoest\springdb\\SaoCarlos/Canchim/GeoStatistic/textura_solo_0.var No. de vanáveis: 3 No. de Lags: 9 No. de Lags usados: 9					
Parâmetros iniciais: Efeito Pepita (Co): 0.002 Para modelo transitivo: Exponencial Contribuição (C1): 0.255 Alcance (a): 1797.510					
Modelo de Semivario	grama Exponencial				
No. Akaike	Efeito Pepita	Contribuição	Alcance		
1 -36.32 2 -36.33 3 -36.33	0.005	0.238 0.238 0.238	1758.861 1740.363 1731.916	-	
Save					
Clear		Close	Help		

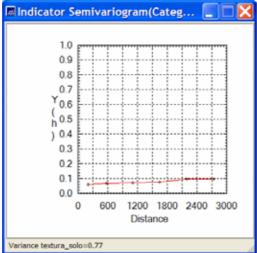
- o Click on the Define... button to open the model parameters window
- o In the Model Parameters window
 - Choose Number of Structures equal 1
 - Fill out the Nugget Effect text field with the value .005
 - For the First Structure options
 - Choose Type: equal Exponential
 - Fill out the Contribution field with value .238
 - Fill out the Anis. Angle with value 0
 - Fill out the Max. and Min. Range fields with value 1731.92
 - Click on the *Apply* button to store the above model parameters

🖪 Model Parameters 🛛 🗖 🔀				
Parameters				
Number of Structures: 1 C 2 C 3 Nugget Effect: 0.005				
First Structure				
Type: Exponential				
Contribution: 238 Anis. Angle: 0				
Max. Range: 1731.92 Min. Range: 1731.92				
Second Structure				
Type: Spherical Contribution: Anis. Angle:				
Max. Range: Min. Range:				
Third Structure				
Type: Spherical 💌				
Contribution: Anis. Angle:				
Max. Range: Min. Range:				
Apply Close Help				

6.5 Generating and fitting variograms for the fourth cutoff (class equal 4)

- Select the textura_solo InfoLayer of the TexturaNumerica Category
- Click on the *Semivariogram Generation* option of the Geostatistics of the Analysis SPRING menu to open the semivariograma generation window.
- In the Semivariogram Generation window
 - Select *Unidirectional* as Analysis:, *Irregular* as Sampling: and *Semivariogram by Indication (Category)* as Options:.
 - Fill out the Cutoff text field with the value equal 4.
 - Select, as Lag Parameters, No Lag: equal 4, Increment 550 and Tolerance 275
 - Select as Direction Parameters the number 1 (0 degrees, omnidirectional variogram)
 - Click on the Apply button to display the respective experimental semivariogram
 - Click on the *Numeric Result...* button to show the Numeric Results window that contains tabular information related to the experimental semivariogram.





- Click on the *Semivariogram Modeling* option of the Geostatistics of the Analysis SPRING menu to open the Semivariograma Modeling window.
- In the Semivariogram Modeling window
 - Select Automatic as Adjusting option
 - Select 1 for the Number of Structures option
 - Select Model 1: Exponential as the Models option
 - Click on the *Apply* button and then click on the *textura_solo_0.var* option of the Adjust Verification list to display the Fit Model and Data Report windows.

🗷 Semivariogram 📃 🗖 🔀	
Adjusting	Fit Model = Exponential
Number of Structures I 2 3 Models Image: Spherical in the spherespherical in the spherespherical in the spherespheric	1.018e-001 9.162e-002 8.144e-002 7.126e-002 Y 6.108e-002 (5.090e-002 h 0.072e-002 3.054e-002 2.036e-002 1.018e-002 1.018e-002 0 600 1200 1800 2400 3000 Distance

	AJUSTE DO SEMIVARIOGRAMA				
Sumário: Arquivo: C: \curso_geoest\springdb\\SaoCarlos/Canchim/GeoStatistic/textura_solo_0.var No. de variáveis: 3 No. de Lags: 6 No. de Lags usados: 6 Parâmetros iniciais: Efeito Pepita (Co): 0.055 Para modelo transitivo: Exponencial Contribuição (C1): 0.032 Alcance (a): 1373.881 Modelo de Semivariograma Exponencial					
Modelo	o de Semivariogra	ama Exponencial			
Modelo No.	-	Efeito Pepita (Contribuição	Alcance	
	-	Efeito Pepita (Alcance 	-

- o Click on the Define... button to open the model parameters window
- o In the Model Parameters window
 - Choose Number of Structures equal 1
 - Fill out the Nugget Effect text field with the value .056
 - For the First Structure options
 - Choose Type: equal Exponential
 - Fill out the Contribution field with value .147
 - Fill out the Anis. Angle with value 0
 - Fill out the Max. and Min. Range fields with value 35463
 - Click on the *Apply* button to store the above model parameters

🖩 Model Parameters 📘 🗖 🔀				
Parameters Number of Structures: 1 2 3 				
Nugget Effect: 0.056				
First Structure				
Type: Exponential 💌				
Contribution: .147 Anis. Angle: 0				
Max. Range: 35463 Min. Range: 35463				
Second Structure				
Type: Spherical 💌				
Contribution: Anis. Angle:				
Max. Range: Min. Range:				
Third Structure				
Type: Spherical 💌				
Contribution: Anis. Angle:				
Max. Range: Min. Range:				
Apply Close Help				

6.6 Kriging the textura_solo sample data with indicator kriging

- Select the textura_solo InfoLayer of the TexturaNumerica Category
- Click on the *Indicator Kriging* option of the Geostatistics of the Analysis SPRING menu to open the Indicator Kriging window.
- In the Indicator Kriging window
 - Click on the Model/Probabilities button to open the window of variogram structural parameters.
 - o In the window of Structural Parameters:
 - Fill out the field Global Prob: for each cutoff value. The sample set has 84 samples where 17 belong class 1, 29 belong to class 2, 32 belong to class 3 and only 6 belong to class 4. So, in this case use the values .2, .35, .38 and .07 for the first, second, third and fourth cutoff values respectivelly. Click on the update button after each probability value is entered.
 - Use the window of Structural Parameters also to check and edit the entered values of variogram structural parameters.
 - Click on the Close button to exit the window of structural parameters.

🖩 Structural Parar	ne 📃 🗆 🔀				
Parameters Cut: 1.000000 2.000000 3.000000 3.000000 4.000000	Global Prob.: 0.20000				
Number of Structures: 1 2 3 Nugget Effect: 0.00600					
First Structure Type: Expone	ential 💌				
Contribution: 0.17800 Max Range: 4149.10					
-Second Structure Type: Spheric					
Contribution:					
Third Structure Type: Spheric Contribution: Max Range:	Anis. Angle:				
Update Delete	Close Help				

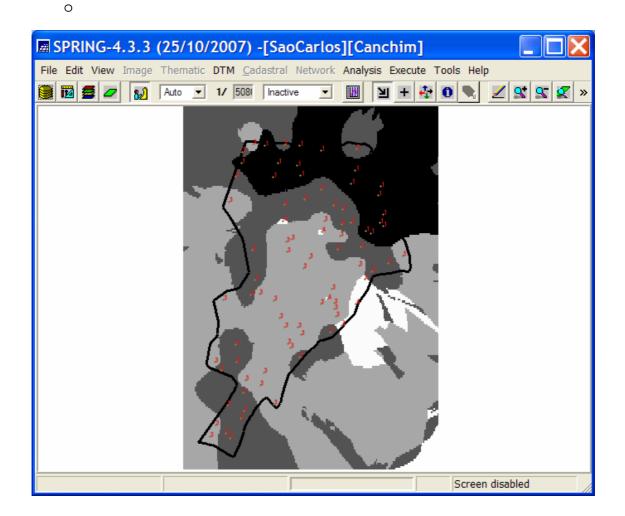
- Back to the Indicator Kriging Window
 - Select as Variable: the option *Categorical*
 - Select as Krig Type: the option Ordinary.
 - Select as Option: the option Full IK.
 - Define the grid parameters ResX: equal 35. and ResY: equal 50. This default values, along with the project bounding box, will generate a grid with 200 rows by 200 columns.
 - Fill out the fields related to the interpolation parameters with the following values: Minimum: equal *4*, Maximum: equal *16*, R.Min: equal *4200*, R.Max: equal *4200* and Angle: equal *0.0*.
 - Choose the output category *TexturaNumerica* clicking on the Category... button
 - Fill out the field IL Values: with the name of the infolayer to be created, *textura_soloik* in this case.
 - Choose as Value: *Mode* and *Max. Probability* as Uncertainty
 - Click on the Apply button to run the indicator kriging procedure

🖩 Indicator Kriging					
Inputs					
Active IL: textura_solo Models/Probabilities					
Kriging Parameters					
Variable: Categoric Indirect Data					
Krig. Type: Ordinary					
Option: Full IK Threshold:					
Grid Parameters					
Bounding Box					
X Res.: 35.000000 Y Res.: 50.000000					
Interpolation Parameters					
Number of Points in the Searching Area					
Minimum: 4 Maximum: 16					
Searching Ellipsoid					
R.Min.: 4200 R.Max.: 4200 Angle: 0.0					
Outputs					
Category Textura Numeric IL Values: textura_soil_ik					
Value: Mode Vincertainty: Max. Probability					
Apply Close Help					

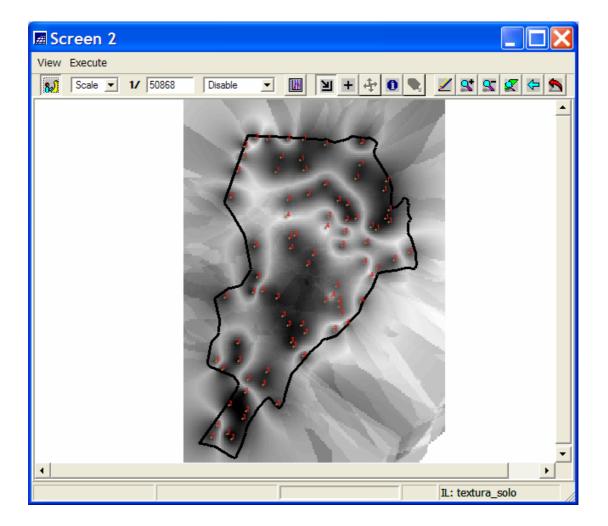
• Repeat the three last steps above replacing the IL Values: by the name by *textura_soloik_shan* and choosing as Uncertainty: *Shannon Entropy*.

6.7 Visualizing the results in the main graphical display of the SPRING

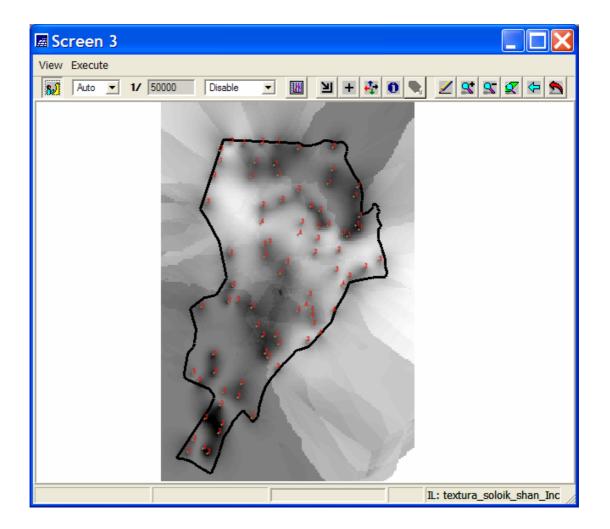
- Displaying the map of estimates of the indicator kriging
- In the Control Panel:
 - Enable the display control 1
 - Select in the list of Categories list: TexturaNumerica
 - Select in the list of Infolayers : textura_soloik
 - Select representation Image
 - Select also the lines of the recorte infolayer of the Limites Category and the samples of textura_solo infolayer of the TexturaNumerica Category
 - Click on the button Draw
- The figure below shows the map of mode estimates obtained from the uncertainty modeling by the indicator kriging for the samples of the *textura_solo* infolayer.



- Displaying the map of uncertainties (Maximum Probability) of the indicator kriging
- In the Control Panel:
 - Enable the display control 2
 - Select in the list of Categories list: TexturaNumerica
 - Select in the list of Infolayers : textura_soloik_Inc
 - Select representation Image
 - Select also the lines of the recorte infolayer of the Limites Category and the samples of textura_solo infolayer of the TexturaNumerica Category
 - Click on the button Draw
 - •
- The figure below shows the map of uncertainty values (Maximum Probability) obtained from the uncertainty modeling by indicator kriging for the samples of the *textura_solo* infolayer.



- Displaying the map of uncertainties (Shannon Entropy) of the indicator kriging
- In the Control Panel:
 - Enable the display control 3
 - Select in the list of Categories list: TexturaNumerica
 - Select in the list of Infolayers : textura_soloik_shan_Inc
 - Select representation Image
 - Select also the lines of the recorte infolayer of the Limites Category and the samples of textura_solo infolayer of the TexturaNumerica Category
 - Click on the button Draw
- The figure below shows the map of uncertainty values (Shannon Entropyy) obtained from the uncertainty modeling by indicator kriging for the samples of the *textura_solo* infolayer.



6.8 Cutting out and visualizing the indicator kriging resulting maps

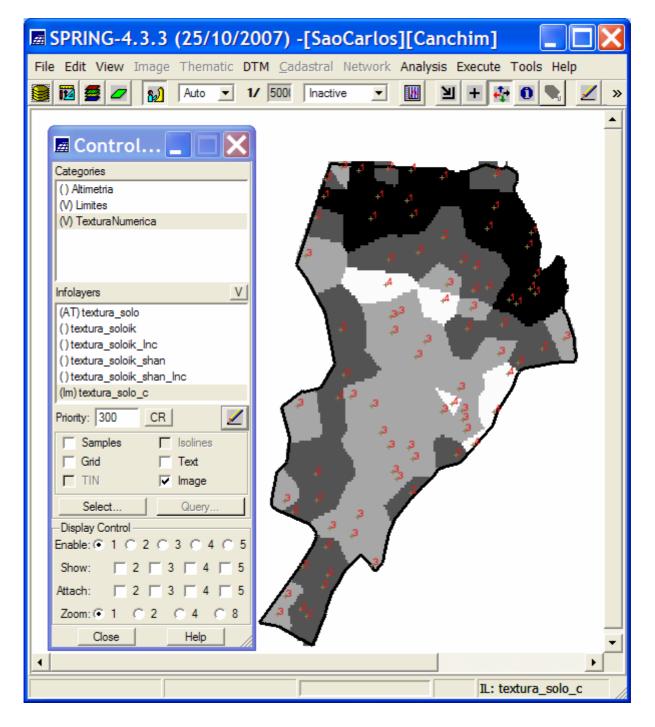
- Select the *textura_solo* infolayer in the SPRING Control Panel
- Choose Cut out Infolayer option of the SPRING Tools menu to open its window.
- o In the Cut out Infolayer window:
 - Choose Select Mask option
 - Click on the Layer... button to open its window

🗷 Cut Out Infolayer	
🙃 Select Mask 🔿 Edit	C Bounding Box
Mask	
Layer recorte	Bounding Box
📕 Keep Mask	
Cut Out	
<u>A</u> ctive IL: textura_solo_c	Internal
C Category:	C External
Apply Close	Help

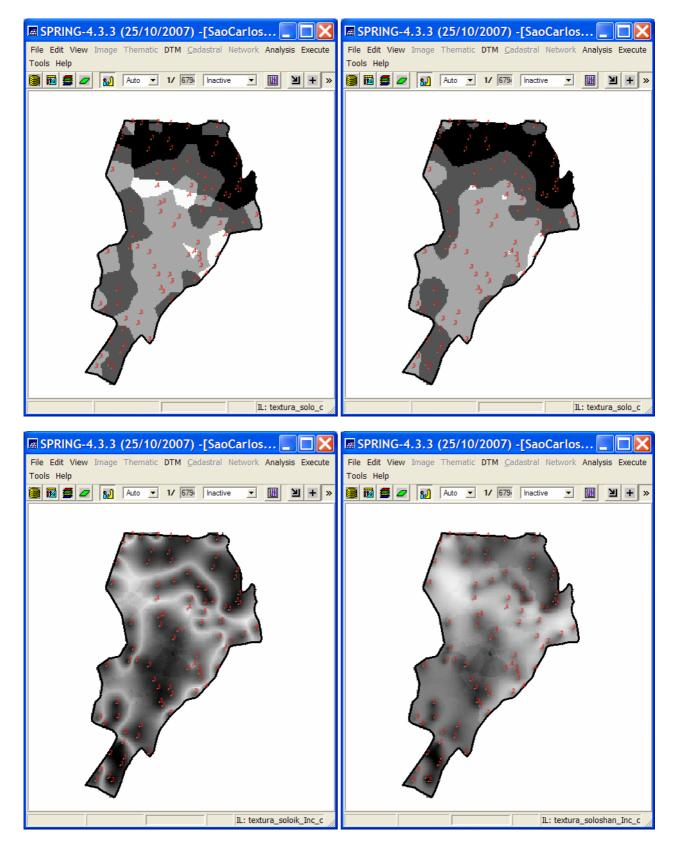
- In the window of Categories and InfoLayers
 - Select as Category Limites and as Infolayers recorte
 - Click on the Apply button
 - Click on the inside area of the recorte polygon that appears in the screen number 5 to select this polygon as the clipping area

	Screen 5			
	View Execute	1/ 5001 Disable		+ 4 0 🗣 🗾 »
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🖩 Categori 📘 🗖 🔀			9	
Categories			\mathbf{i}	
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Infolayers	{			
recorte		(
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	41			
Apply Close Help				
				Screen disabled

- o Back into the Cut out Infolayer window
 - Change the name of the Active IL: to textura_solo_c
 - Keep the Internal option selected
 - Click on the *Apply* **button** to create the *textura_solo_c* Infolayer
 - Visualize the textura_solo_c Infolayer as done for the textura_solo Infolayer in the subitem "Visualizing the data and texts of soil texture of the Canchim region" of the 6.1 item.
 - The Figure below shows the resulting of the visualization



• Repeat the 6.8 item for cutting out an visualizing the infolayers: textura_soloik, textura_soloik_Inc and textura_soloshan_Inc. The resulting maps are shown below.



• Observation: The estimate maps can be visualized as thematic maps using different colors for the different classes. To accomplish this it is necessary to create a thematic category with 4 classes (sandy, medium clayed, clayed and too clayed). After that select the estimate infolayer (in the control panel) and run the function Slicing of the DTM option of the SPRING menu.

🗖 DTM Slicing 📃 🗖 🔀	
Output Category	
Output Layer: textura_soloik_c_sliced	
Slice Definition	
Slices-Classes Association	
Apply Close Help	

	Slices-Classes
Min. Z Value: 1.000000 Max. Z Value: 4.000000 Step: © Fixed © Variable Slices	Classes 1. Arenosa 2. Medio Argilosa 3. Argilosa 4. Muito Argilosa 5. Sem Classe None
Start: .5 0.000000 - 1.000000 End: 4 1.000000 - 2.000000 2.000000 Step: 1 3.000000 - 4.000000 3.000000	Association: Silces-Classes 0.000000 - 1.000000 -> 1. Arenosa 1.000000 - 2.000000 -> 2. Medio Argilosa 2.000000 - 3.000000 -> 3. Argilosa 3.000000 - 4.000000 -> 4. Muito Argilosa
Insert Delete Apply Close Help	Apply Close Help

The resulting estimate maps (closest neighbors and indicator kriging) are shown below.

