

Methodology for Automating Cartometric Evaluation of Urban Topographic Maps in Brazil

Mônica C. Castro

Dr^a Claudia Robbi Sluter

Introduction

- Brazilian official maps – 1:2,000 scale
- Smaller scale – not produced by cartographic generalization
- Methodology – appropriate for the Brazilian landscape
- Cartographic generalization – cartometric evaluation
- Which features to generalize and which operators to use?

(McMaster & Shea, 1992)

Research goal

To present a method for developing cartometric evaluation for a topographic map at 1:5,000 derived from a 1:2,000 scale

Cartometric evaluation components:

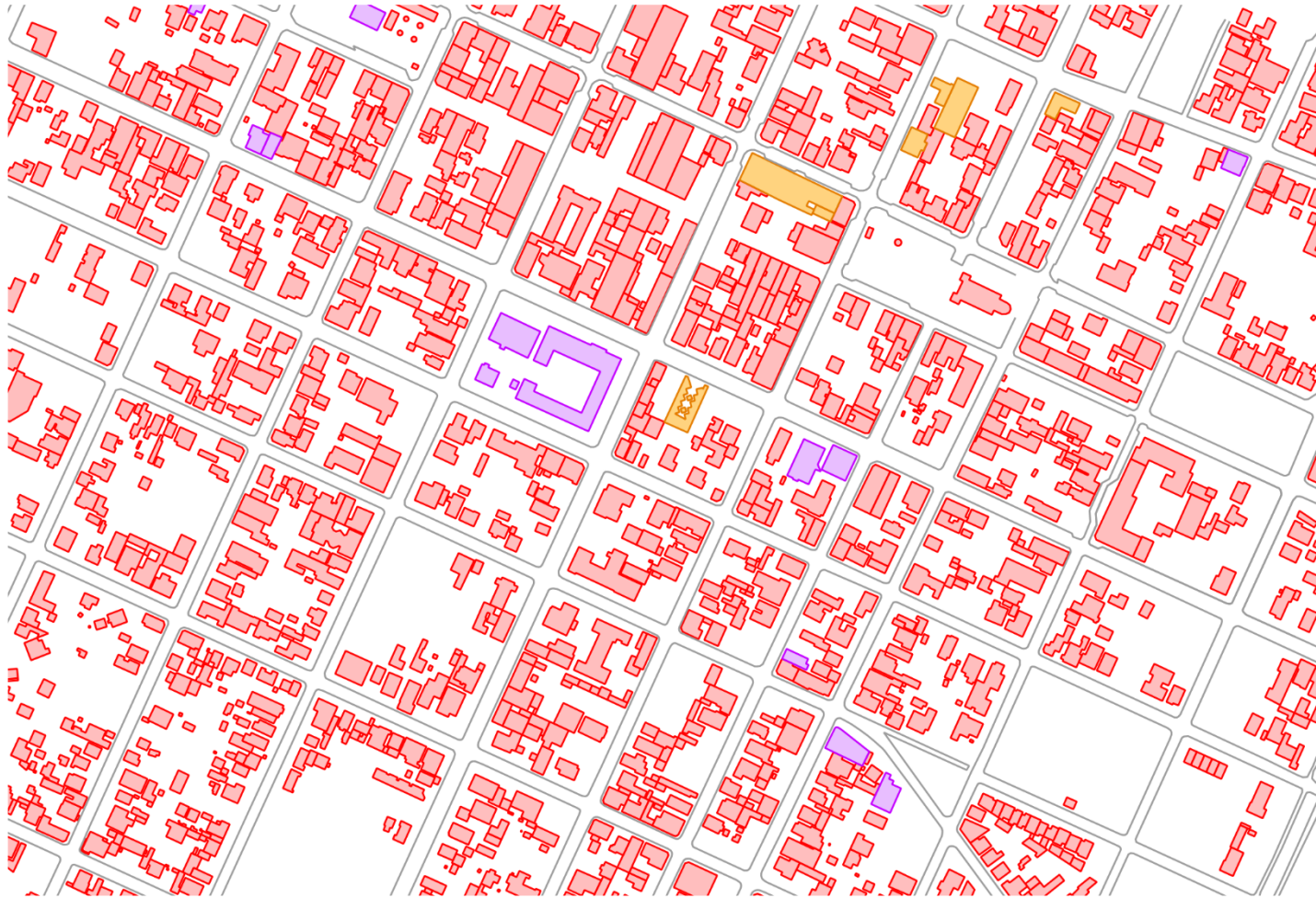
- Geometric conditions
- Spatial and holistic measures

Proposed Method

1. Identifying the representation problems on the map when its scale is reduced
2. Defining the constraints related to each representation problem
3. Defining the generalization operators
4. Formalizing the rules that describe each problem and operator
5. Designing and implementing the expert system



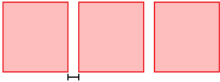
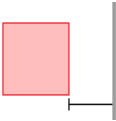


Identification of representation problems



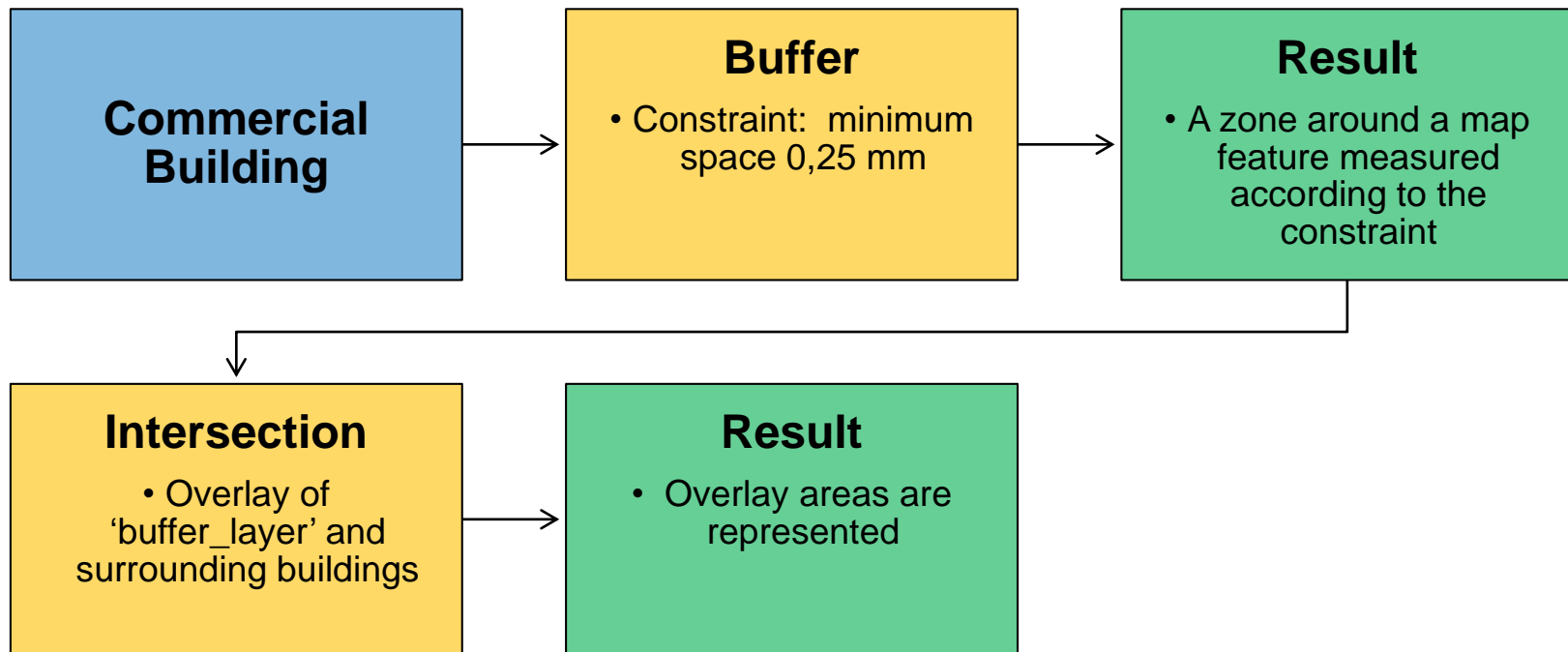
Geometric Conditions and representation problems

Geometric Conditions	Constraints	Representation Problems
Imperceptibility	Length of solid square side Interior corner	Visibility
Congestion Coalescence	Distance - line and building Distance – buildings	Legibility

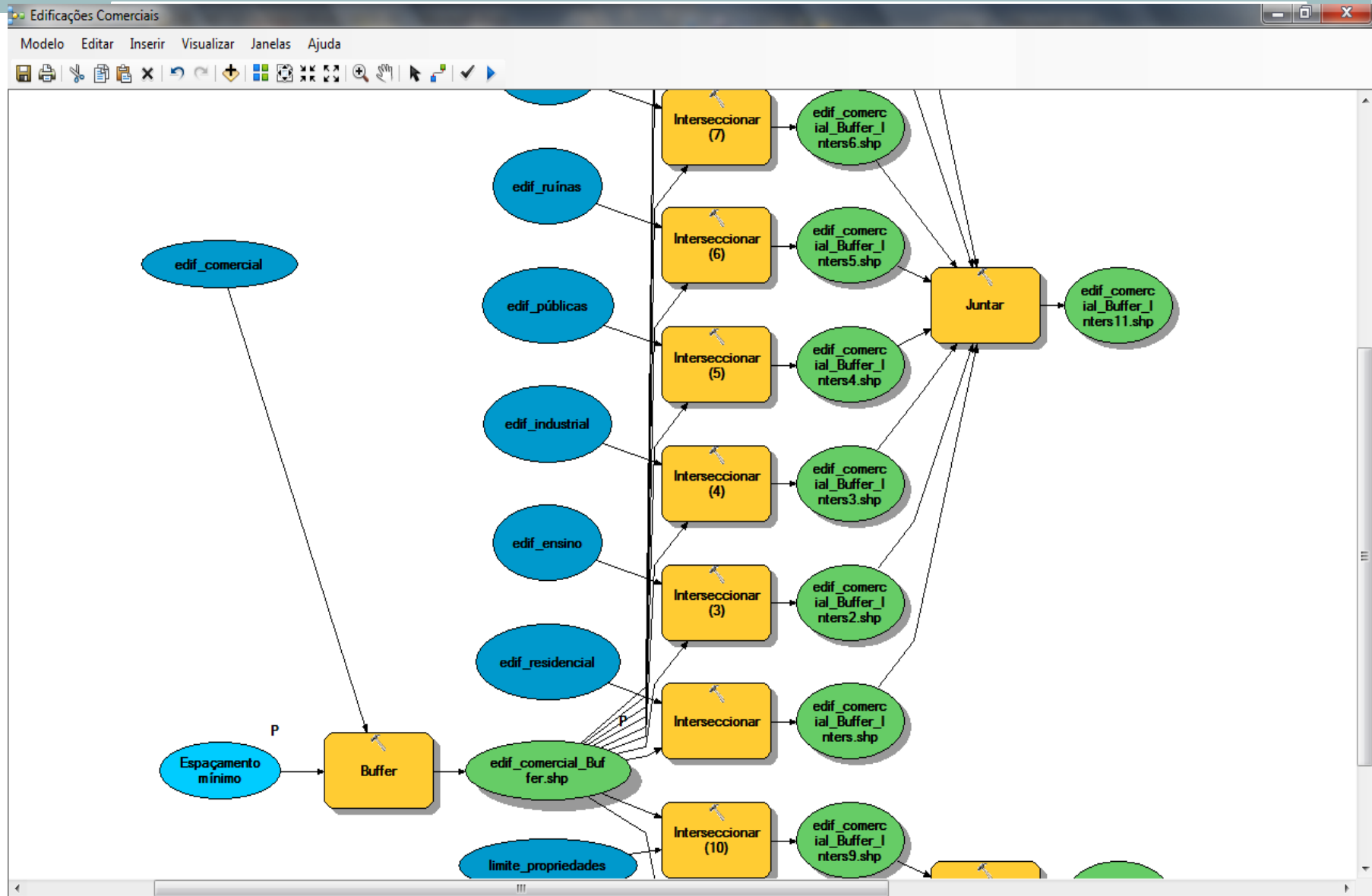
Constraints

Symbol	Remarks	Minimun value (mm)		
		IGN	SSC	TAURA
	Distance between buildings	0,15	0,20	0,25
	Distance between a line and a building	-	0,20	0,25
	Interior corner	0,30	0,25	0,30
	Length of solid square side	0,50	0,35	0,30

Expert system design - ModelBuilder



Expert system design - ModelBuilder





Parcial Results - ModelBuilder

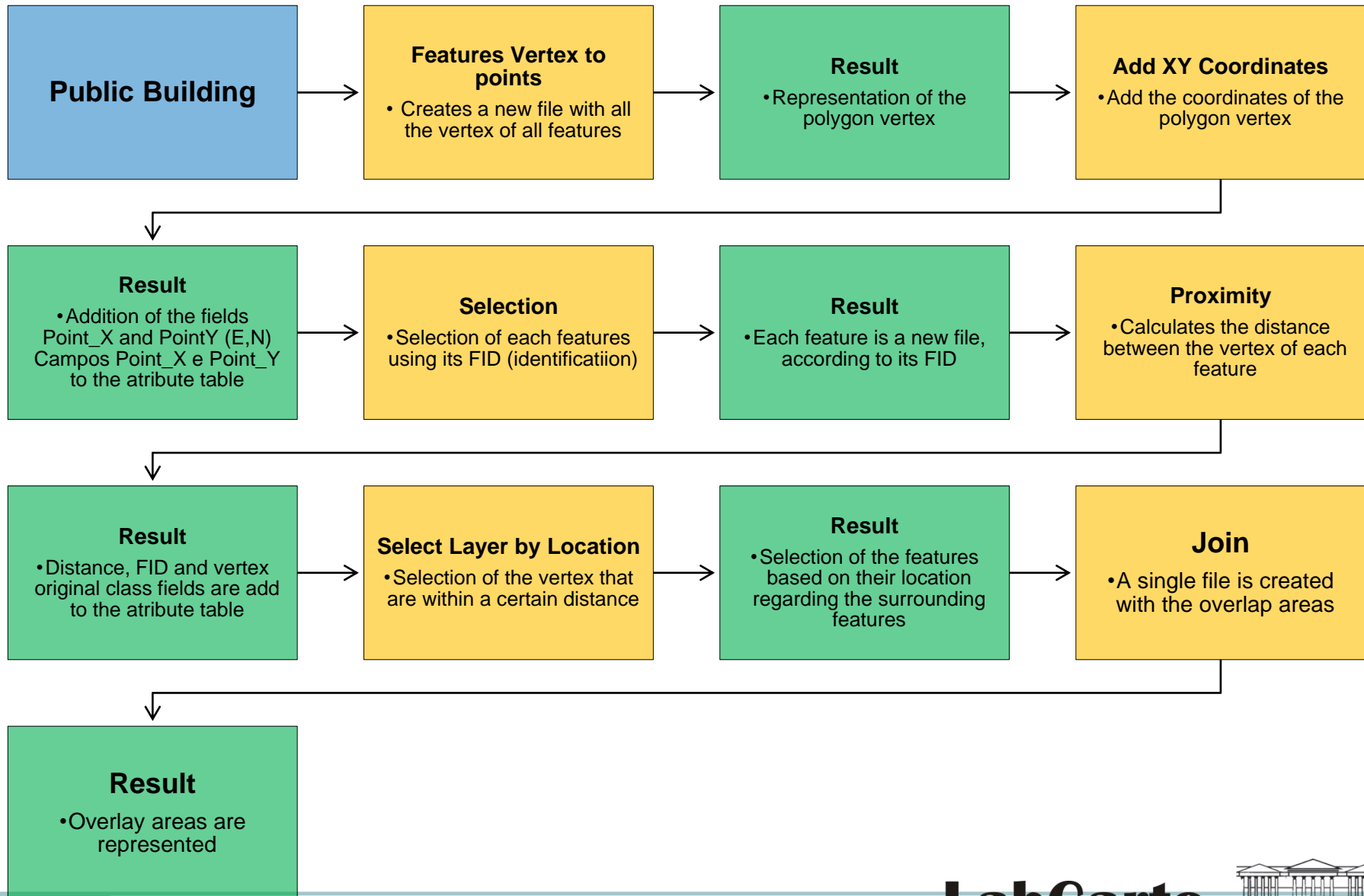
Tabela					
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FID	Shape	NOME	NEAR FID	NEAR DIST	NEAR FC
0	Polígono	DEPÓSITO DO PODER JUDICIÁRIO DA COMARCA DE PINHAIS	9047	0	edif_residencial
1	Polígono	DEPÓSITO DE ARQUIVOS DO DETRAN	9365	0	edif_residencial
2	Polígono	DEPÓSITO DE ARQUIVOS DO DETRAN	9351	0	edif_residencial
3	Polígono	DEPÓSITO DE ARQUIVOS DO DETRAN	5386	1,176102	limite_propriedades
4	Polígono	DEPÓSITO DE ARQUIVOS DO DETRAN	5403	0	limite_propriedades
5	Polígono	MÓDULO POLICIAL	5613	10,592815	limite_propriedades
6	Polígono	COPEL	6010	0	limite_propriedades
7	Polígono	CORREIOS	11920	0	edif_residencial
8	Polígono	CORREIOS	12327	0	edif_residencial
9	Polígono	TELEPAR	15923	3,068306	edif_residencial
10	Polígono	TELEPAR	10054	1,919291	limite_propriedades
11	Polígono	DEPÓSITO DA COPEL	10024	5,459902	limite_propriedades
12	Polígono	SANEPAR	11432	0	limite_propriedades
13	Polígono	SANEPAR	11828	0	limite_propriedades
14	Polígono	SANEPAR	11501	0	limite_propriedades
15	Polígono	SANEPAR	11500	0	limite_propriedades
16	Polígono	SANEPAR	11500	0,92112	limite_propriedades
17	Polígono	SANEPAR	11433	1,421552	limite_propriedades
18	Polígono	SANEPAR	11433	6,265977	limite_propriedades
19	Polígono	SANEPAR	11433	7,655085	limite_propriedades
20	Polígono	SANEPAR	11433	39,794123	limite_propriedades
21	Polígono	BARRACÃO COHAB-CT	24918	0,836675	edif_residencial
22	Polígono	POSTO POLICIAL	29499	0	edif_residencial
23	Polígono	SECRETARIA MUNICIPAL DE SAÚDE	18333	14,096913	limite_propriedades
24	Polígono	SECRETARIA MUNICIPAL DE SAÚDE	17356	0	limite_propriedades
25	Polígono	SECRETARIA MUNICIPAL DE SAÚDE	18330	0	limite_propriedades
26	Polígono	CODAPAR PINHAIS	20542	26,035103	limite_propriedades
27	Polígono	CODAPAR PINHAIS	20544	12,228548	limite_propriedades
28	Polígono	PREFEITURA MUNICIPAL DE PINHAIS	19900	0	limite_propriedades
29	Polígono	PREFEITURA MUNICIPAL DE PINHAIS	19902	0	limite_propriedades
30	Polígono	PREFEITURA MUNICIPAL DE PINHAIS	19903	0	limite_propriedades
31	Polígono	PREFEITURA MUNICIPAL DE PINHAIS	19903	0	limite_propriedades
32	Polígono	PREFEITURA MUNICIPAL DE PINHAIS	19902	0	limite_propriedades
33	Polígono	PREFEITURA MUNICIPAL DE PINHAIS	19902	0	limite_propriedades
34	Polígono	PREFEITURA MUNICIPAL DE PINHAIS	19902	14,798935	limite_propriedades
35	Polígono	SECRETARIA MUNICIPAL DE OBRAS E URBANISMO	20555	0	limite_propriedades
36	Polígono	TABELIONATO DE NOTAS MARTINE	20273	0	limite_propriedades
37	Polígono	SANEPAR	20359	3,546315	limite_propriedades
38	Polígono	SANEPAR	20356	5,990696	limite_propriedades
39	Polígono	SANEPAR	20359	3,193705	limite_propriedades
40	Polígono	SANEPAR	20359	2,814555	limite_propriedades
41	Polígono	SANEPAR	34712	7,534786	edif_residencial
42	Polígono	SANEPAR	20359	2,564181	limite_propriedades

1

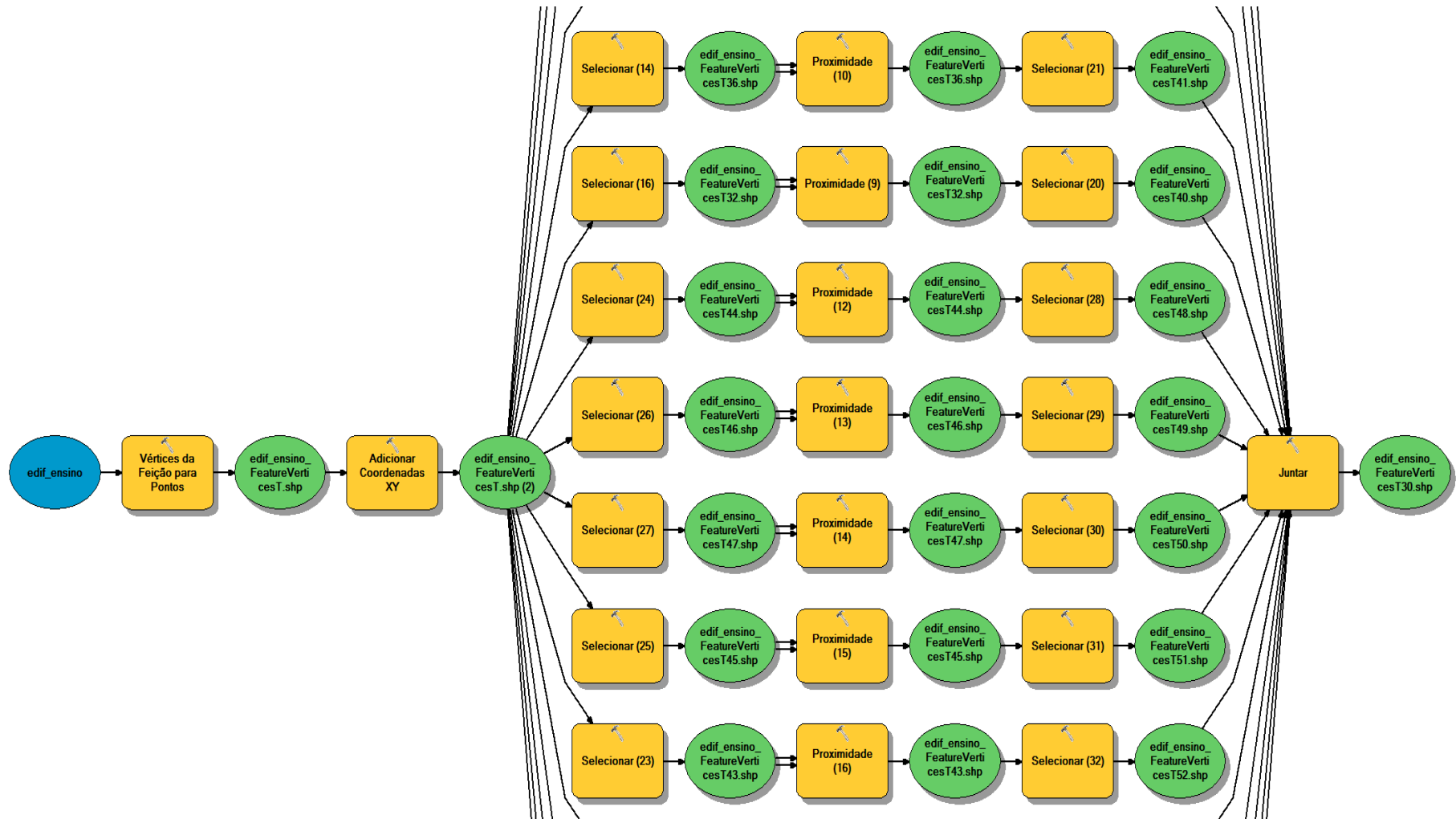
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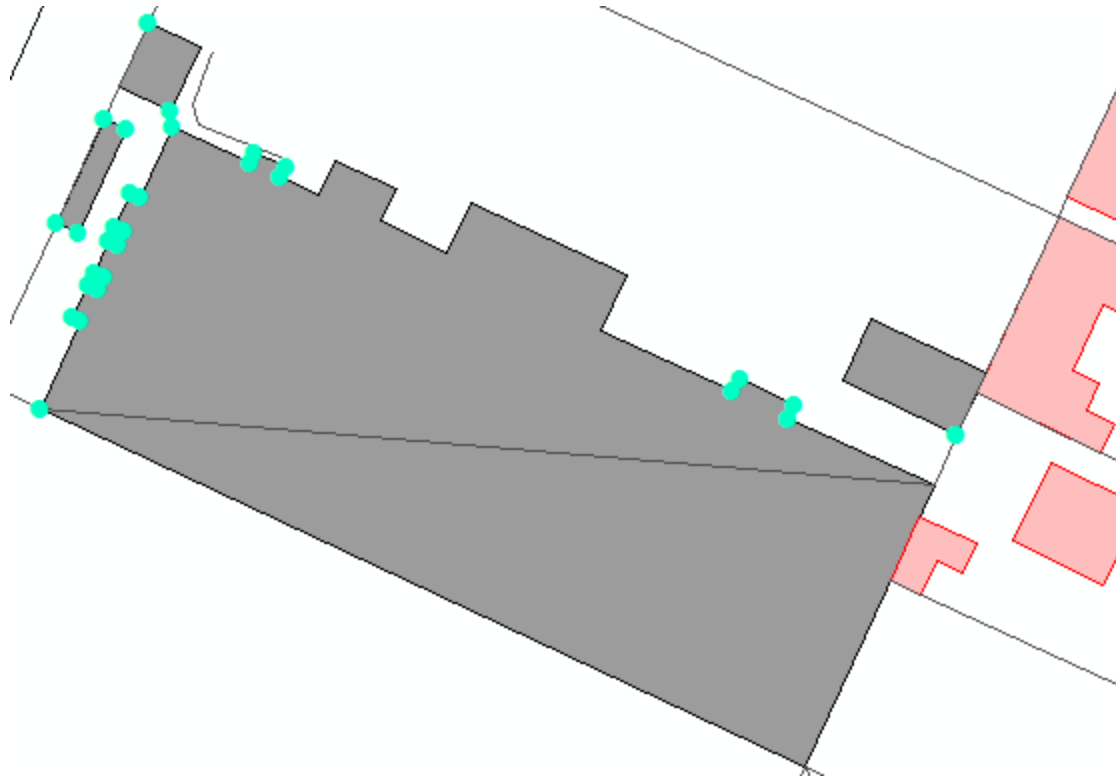
Expert system design - ModelBuilder



Expert system design - ModelBuilder



Parcial Results - ModelBuilder

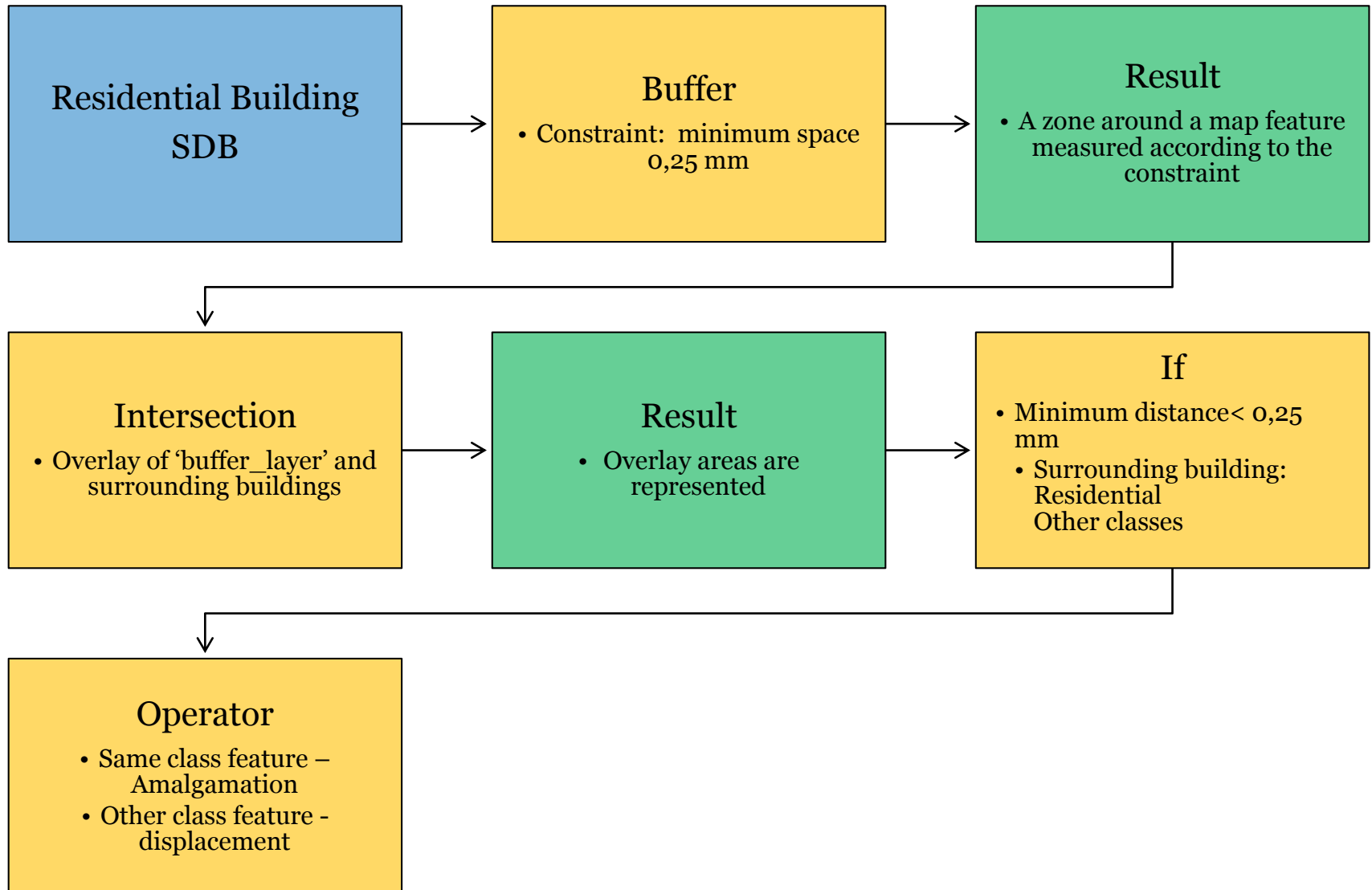


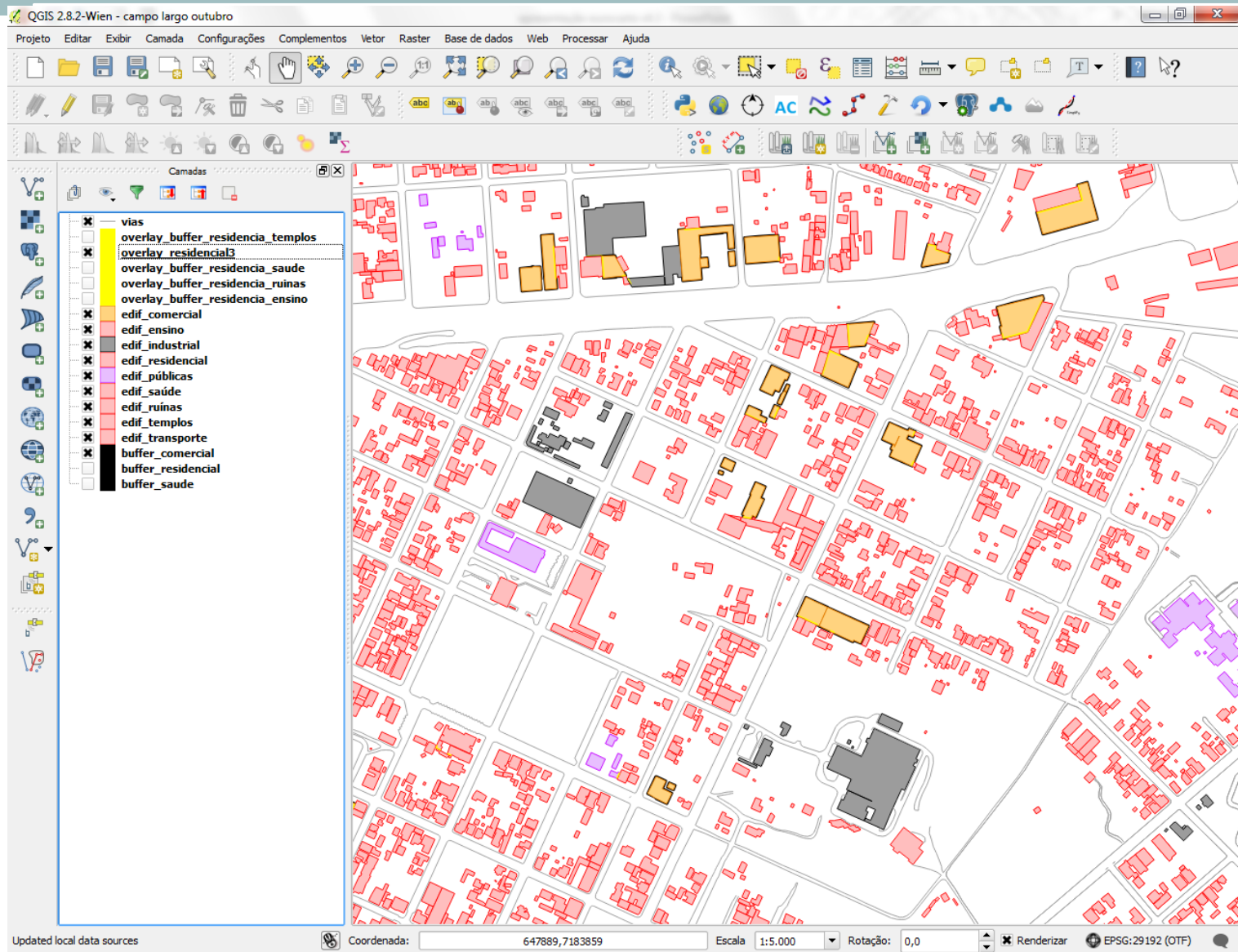
Results – geometric conditions

1. Congestion and coalescence– distance between features– area and line features
2. Imperceptibility – interior corners and length of solid square side – point features

Develop an expert system to perform
cartometric evaluation on QGIS

Expert system design - QGIS





Conclusion

- This is a work in progress
- **ModelBuilder** – Human-computer interaction
- Expert system
 - ✓ Legibility problems automated detection - good results
 - ✓ Imperceptibility problems – features analyzed individually
- Expert system – less human dependable and generalization process more efficient

THANK YOU

