

Predicting urban growth in Fredericton using the SLEUTH Model

By:

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Faculty Supervisor:

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Overview

Motivation

Description of the Model

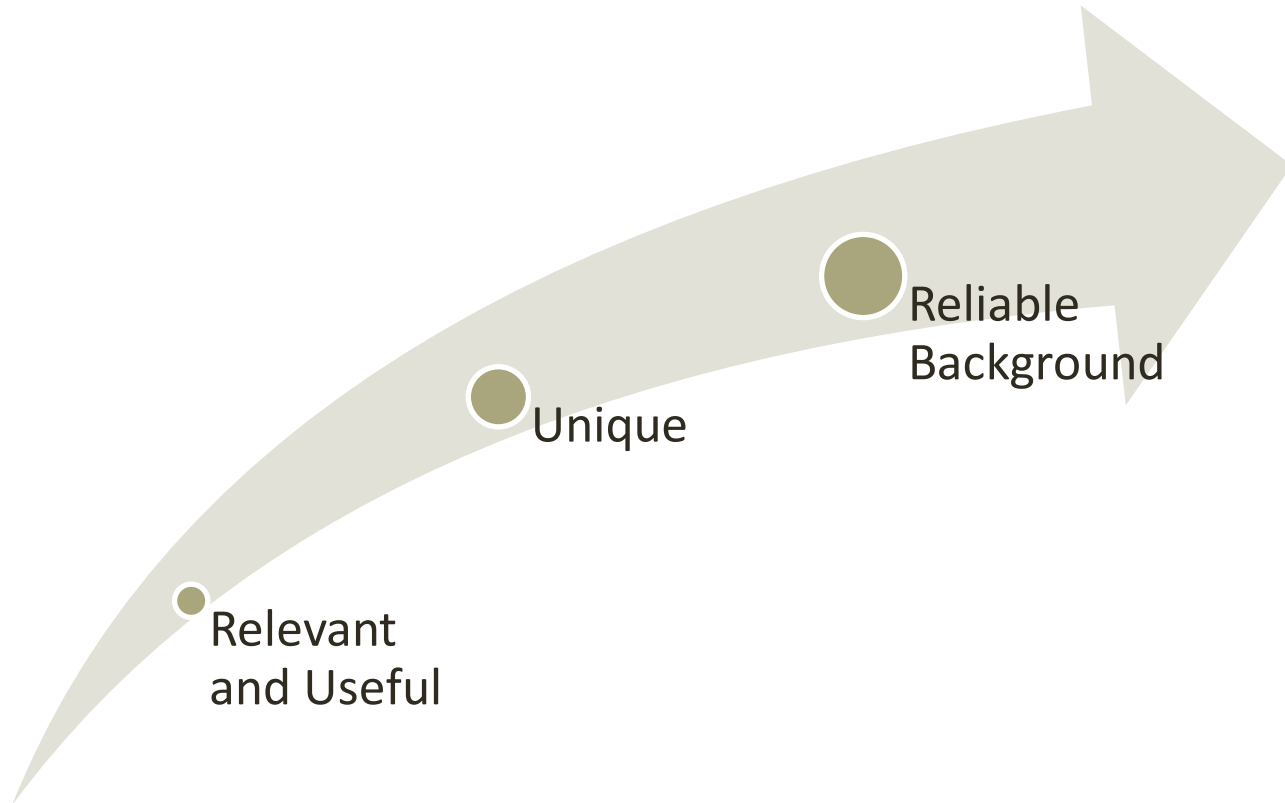
Process

Results

Conclusion

Acknowledgements

Motivation



The SLEUTH Model

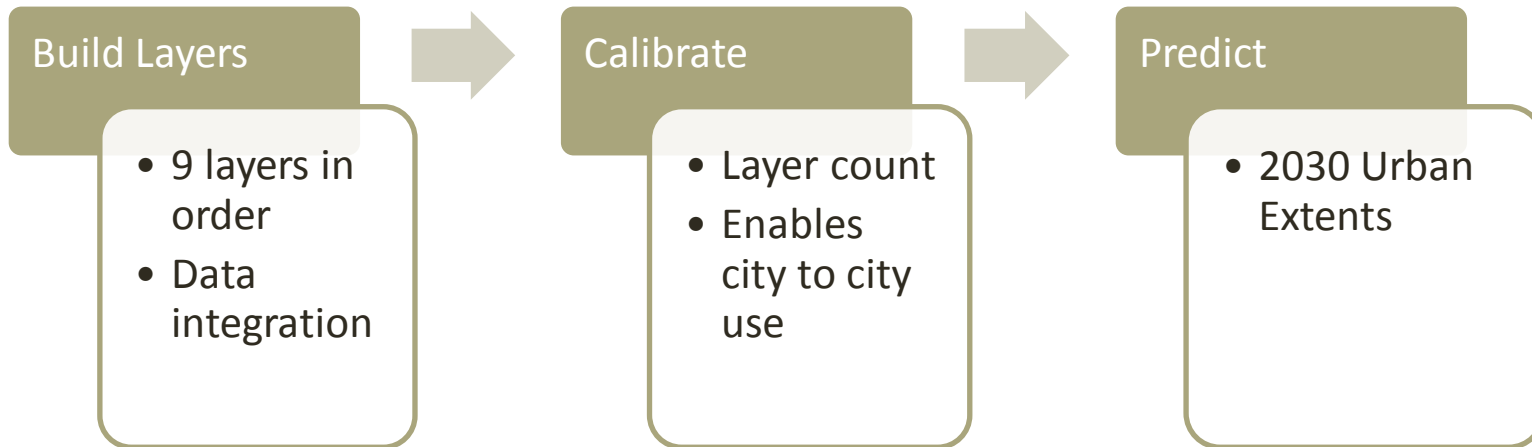
| Model | Order | Count | Data | Source |
|--------------------|-------|-------|-------------------|--------|
| S – Slope | N/A | 1 | DTM | GeoNB |
| L – Land Use | N/A | N/A | N/A | N/A |
| E – Excluded | 2 | 1 | Features | GeoNB |
| U – Urban | 3 | 4 | Satellite Imagery | USGS |
| T – Transportation | 1 | 2 | Feature | GeoNB |
| H – Hillshade | N/A | 1 | DTM | GeoNB |



N/A => Not Applicable

DTM => Digital Terrain Model

The SLEUTH Model



Process

Choosing a study area

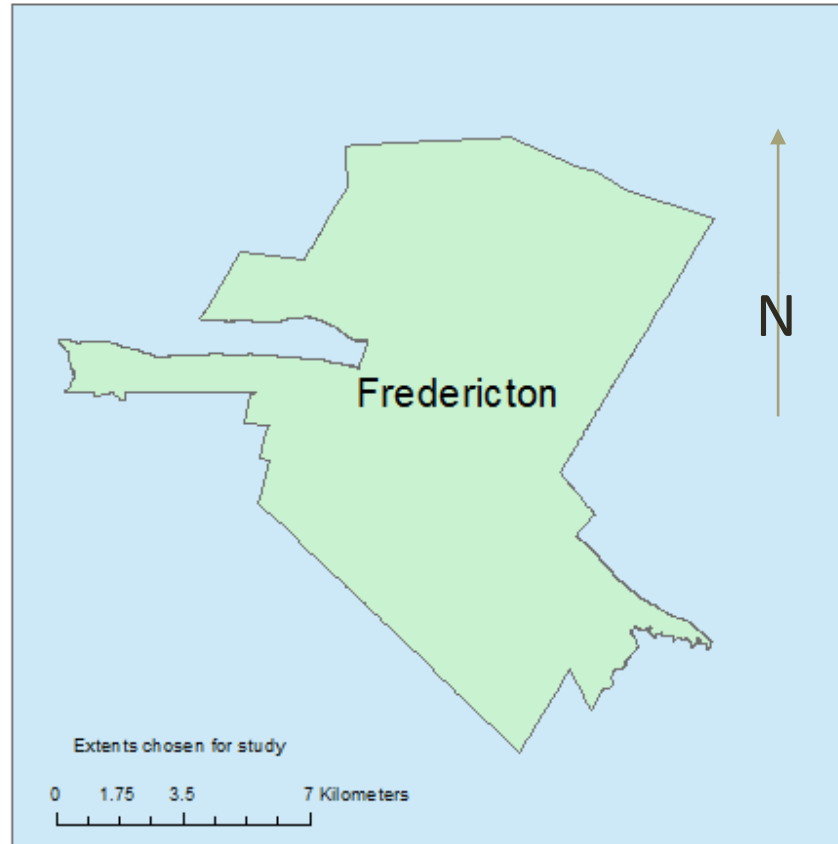
- Study area in Blue
- Fredericton city limits in Green

Open data only

- Availability
- Quality

Validation of results

- Urban growth comparison



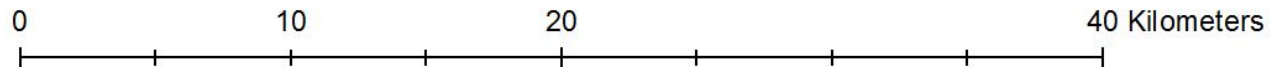
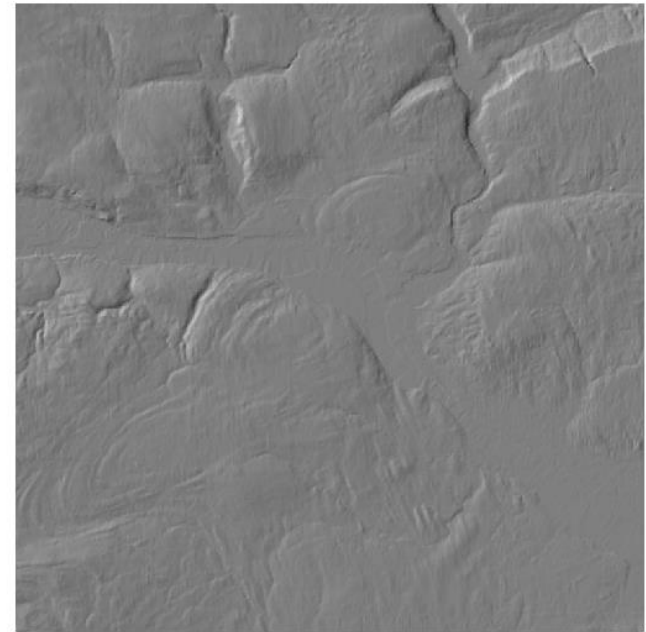
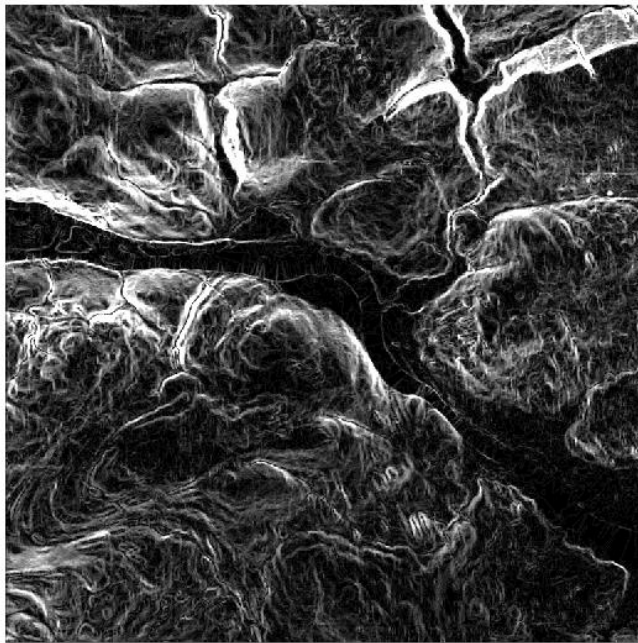
Coordinate System: NAD 1983 CSRS New Brunswick Stereographic
Projection: Double Stereographic
Datum: North American 1983 CSRS
False Easting: 2,500,000.0000
False Northing: 7,500,000.0000
Central Meridian: -86.5000
Scale Factor: 0.9999
Latitude Of Origin: 46.5000
Units: Meter

Build – Slope and Hillshade Layers

Legend

slopes %

Value

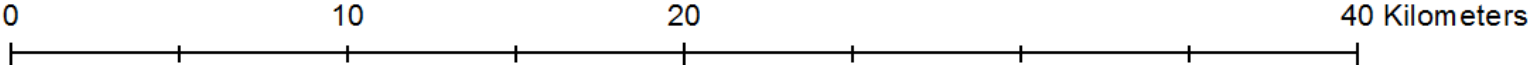
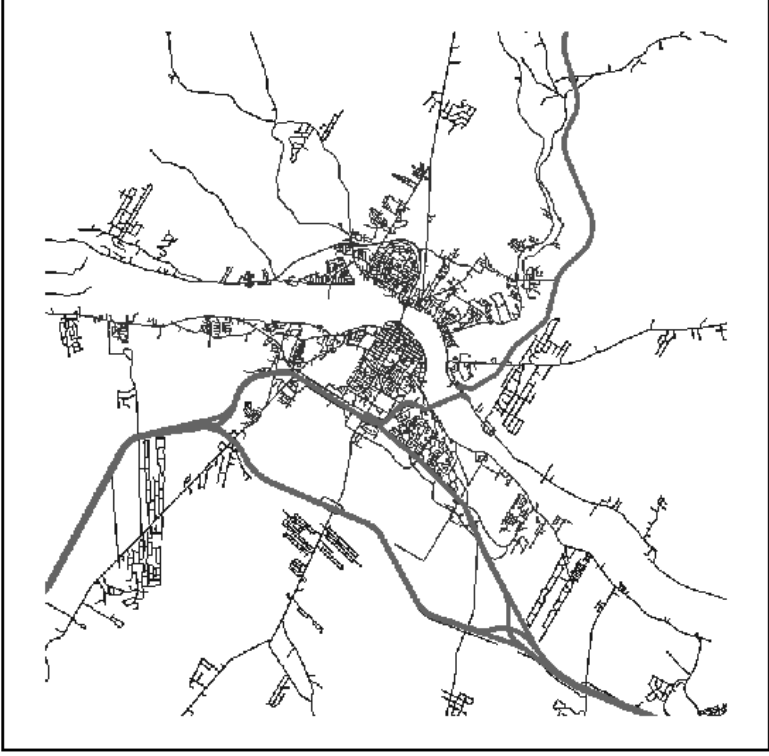


Build- Road Layers

1975



2014








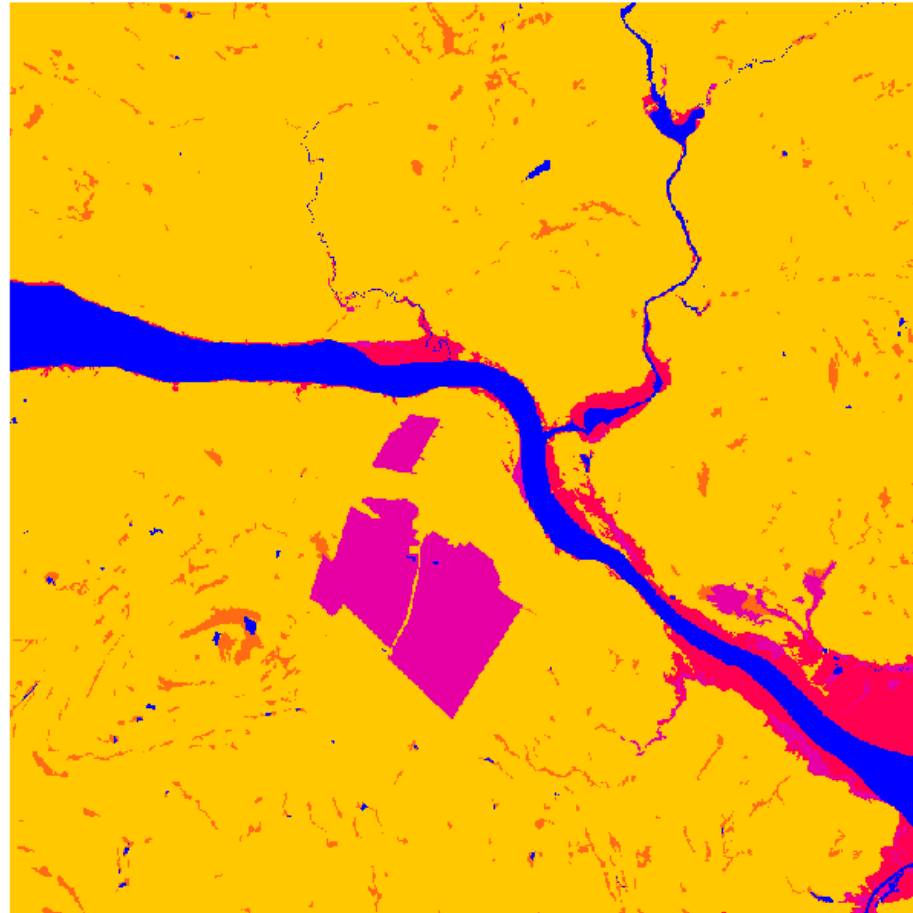
Build – Excluded Layer

Legend

Excluded Zones

Value

| | |
|-----------------------------------------------------------------------------------|------------------|
|  | Un-Excluded (0) |
|  | Protected 1 (15) |
|  | Flood (50) |
|  | Protected 2 (75) |
|  | Water (100) |



0 5 10 20 Kilometers

Build – Urban Layers

1975, 1990, 2000, 2014



Landsat 8 imagery, found on USGS repository

Calibration

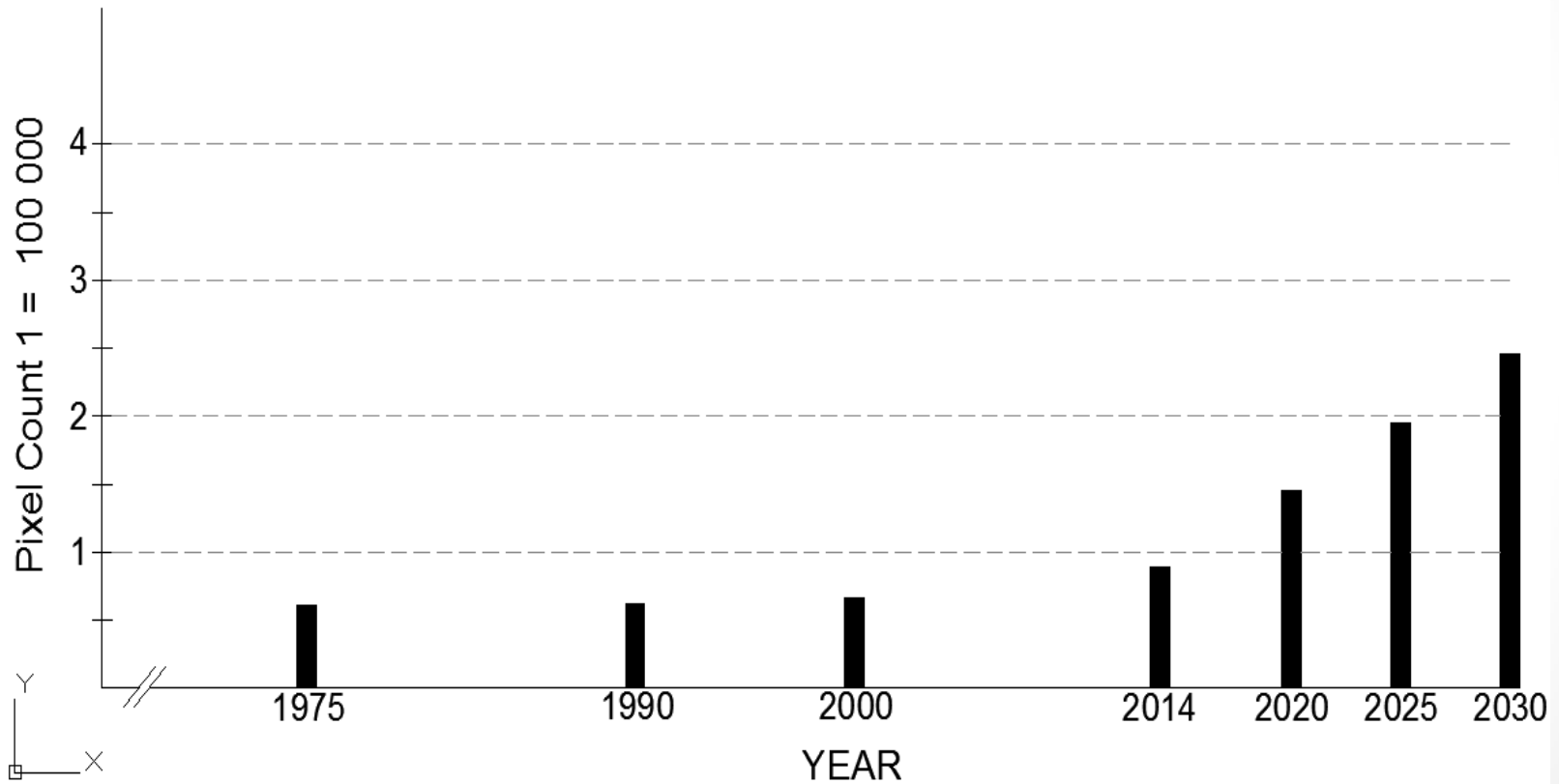
Looking for 5 growth coefficients values, ranging 0 – 100.

5 hours total calibration time, 10240 iterations

| Growth Coefficient | Calibrated Value | Description |
|--------------------|------------------|-----------------------------------------------|
| Dispersion | 20 | Random or spontaneous growth |
| Breed | 20 | New spreading centre created by random growth |
| Spread | 20 | Urban centre has additional growth |
| Slope | 80 | Effect of slope reducing urbanization |
| Road Gravity | 20 | Urban growth next to transportation network |

Results

Historical and Predicted Urban Growth



Model
Output



Conclusion

- ✓ Reliable background
- ✓ Unique
- ✓ Relevant and Useful

Thank You

Presented by:
Charles-Olivier Cyr

Acknowledgements:

Dr. Al-Tahir, Dr. Monica Wackovicz, Mr. David Fraser, Dr. Keith Clarke and the faculty of computer science for their huge help throughout the course of my design project.

Questions ?