Master Thesis Proposal

Pierre Callies

The Longitudinal and Cross Sectional Economic Impacts of Highway Interchanges

Rogers, MN, Interchange I -94 and US-101

Normandale Community College, Bloomington – Minnesota, South Parking Lot

Saint Cloud State University

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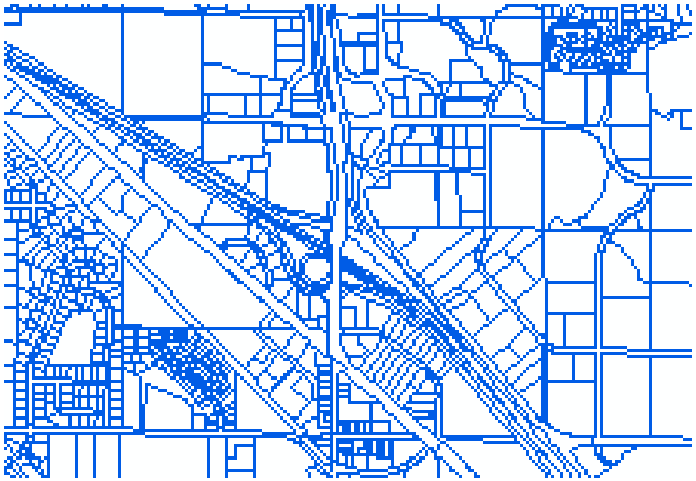
Geographic Information System Program
May 8th, 2013

Questions

Do four-lane highway exit-ramps or interchanges generate a cross-sectional or spatial and longitudinal or temporal economic growth in areas surrounding them?



If economic Impact,

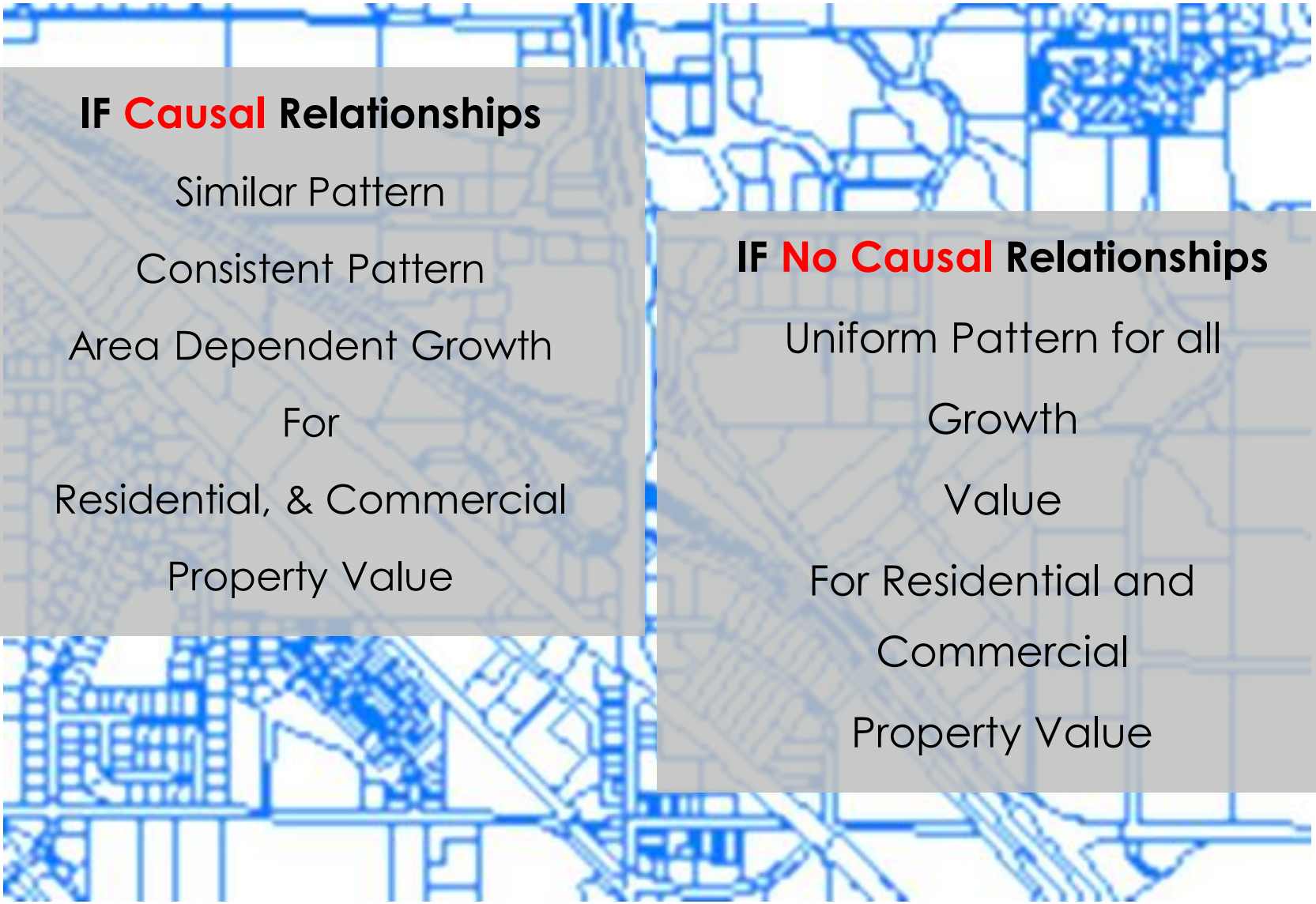
- How much?
- How far?
- For How long?

Purpose

To determine the **existence** and **strength** or inexistence and weakness of **causal** relationship between **property values** and their **accessibility** to I-94-MN-101 interchange.

The property values would be the dependent variable, and its accessibility should be one independent variable with a strong weight into the regression

If / If Not?



IF Causal Relationships

Similar Pattern

Consistent Pattern

Area Dependent Growth

For

Residential, & Commercial

Property Value

IF No Causal Relationships

Uniform Pattern for all

Growth

Value

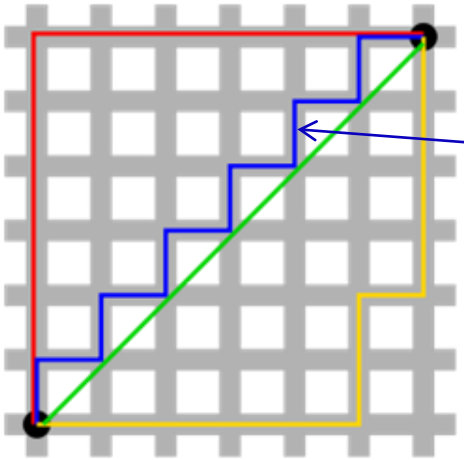
For Residential and

Commercial

Property Value

Concepts

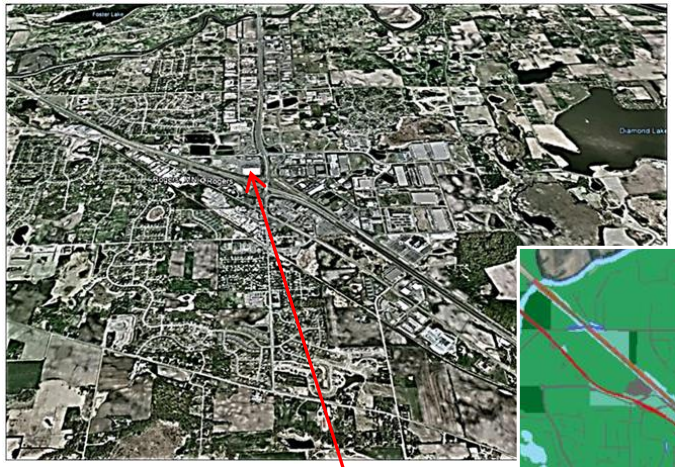
- MetroGIS Databases
  - Property Values
- MnDot Databases (Minnesota Department of Transportation)
  - Traffic Flow Sensor
  - Road Characteristics



*The **time adjusted true value** **distance*** as the **Manhattan physical distance** between two points that is weighted by the number of road blocks such as stop lights and signs, speed limits, congestions, and other restrictions that impair the mobility of commuters and accessibility of sites .

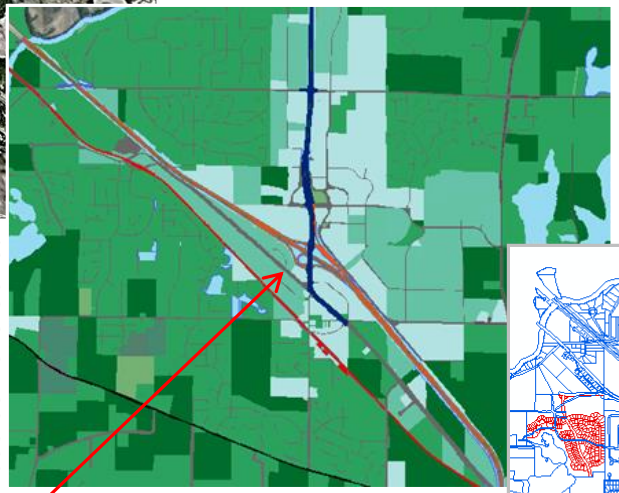
Tools

Rogers, Minnesota



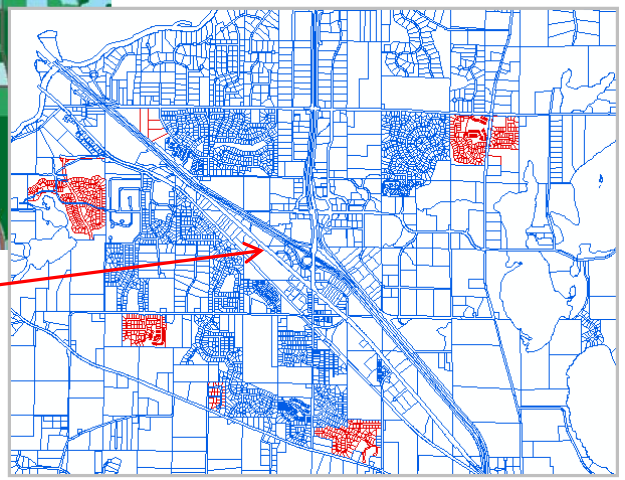
Source Google Earth

Photography



Source Pierre Callies

Land Use



Source MetroGIS

Property Identification and Changes

Interstate 94 and MN 101 Interchange

Parsimonious and Expended Specifications

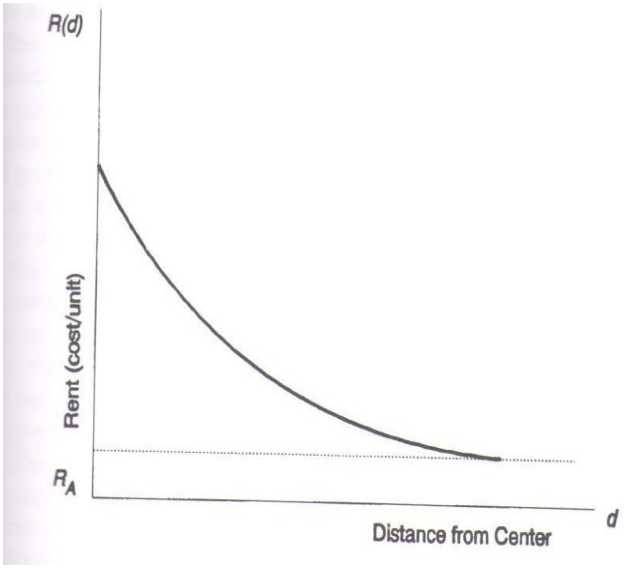
Disaggregation increases the prediction accuracy of hedonic house price estimates and that the procedure used to construct housing submarket can contribute to the efficiency of resulting market value predictions .

(Goodman and Thibodeau 2003)

Brigham 1965

*If transportation were **instantaneous** and **costless**, then the urban population could **spread out over all usable** and all land price would be reduced to their approximate value in the best alternative use. But transportation is not instantaneous and costless, and since modern life requires the concentration of people in cities, urban land takes on a special accessibility value.*

Land Prices



Land price is proportional to lend rent, and the price of land at the boundary of an urban area equals the value of Agricultural Land.

Hanson & Giuliano

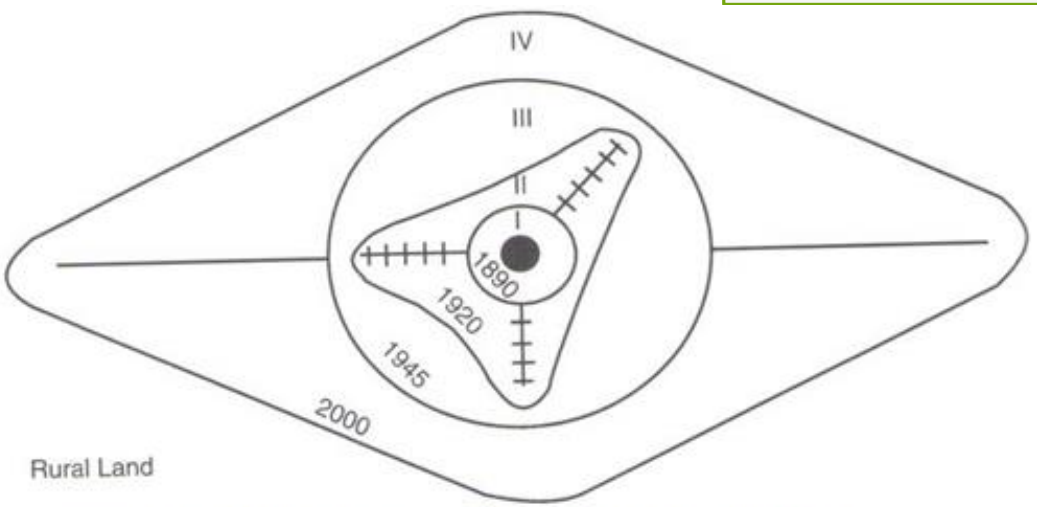


Figure 1 - Urban Development (Hanson and Giuliano 2004 P 63)

Hanson and Giuliano describe it:

I. Walking-Horsecars era (1800-1890)
II. Electric Street Car era (1890-1920).
III. Recreational Automobile Era (1920-1945).
IV. freeway era (1945-present)

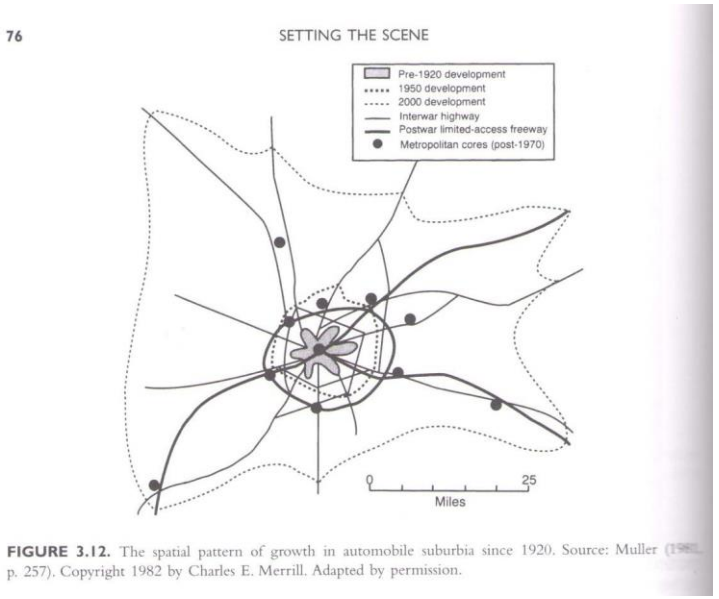


FIGURE 3.12. The spatial pattern of growth in automobile suburbia since 1920. Source: Muller (1981, p. 257). Copyright 1982 by Charles E. Merrill. Adapted by permission.

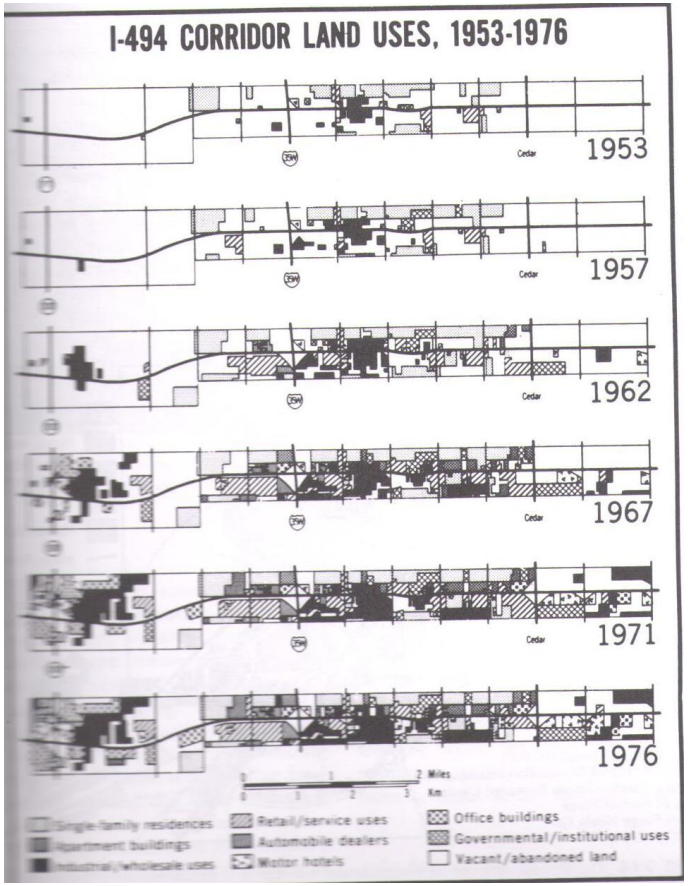
Time-Space-Cost Convergences

if the price that a retailer is willing to pay for the product is precisely equal to the manufacturer's marginal production and transaction cost associated with that retailer. On the other hand if the manufacturer's marginal production and transaction cost exceeds what the retailer is willing to pay for the product, then there will be zero shipment of the product between the pair.

(Dong, Zhang, and Nagurney 2004 P196)

Time-Space-Cost Convergences

- 45 Minutes Time Limits One Way
  - Work
  - Home
  - Day caring, Shopping, Schooling, + ???
- Distance Covered Proportional to
  - Mobility Speed Limits
  - Accessibility
  - Wealth
  - Economic Vitality
- Distance Covered Inversely Proportional to
  - Energy Costs
  - Traffic Jams
  - Road Blocks
  - Induced Congestions
  - Parking Restrictions



Why Rogers, MN

- 45 Minutes from
  - St Cloud
  - Most Twin Cities Locations
- Natural Barriers
  - Crow River
  - Mississippi
- Two Access Points
  - I 94
  - US 10
- Diverse Accessibility
  - North
  - South
- Four distinct Areas
  - Limited by 101 and 94
- Two Potential Access Points

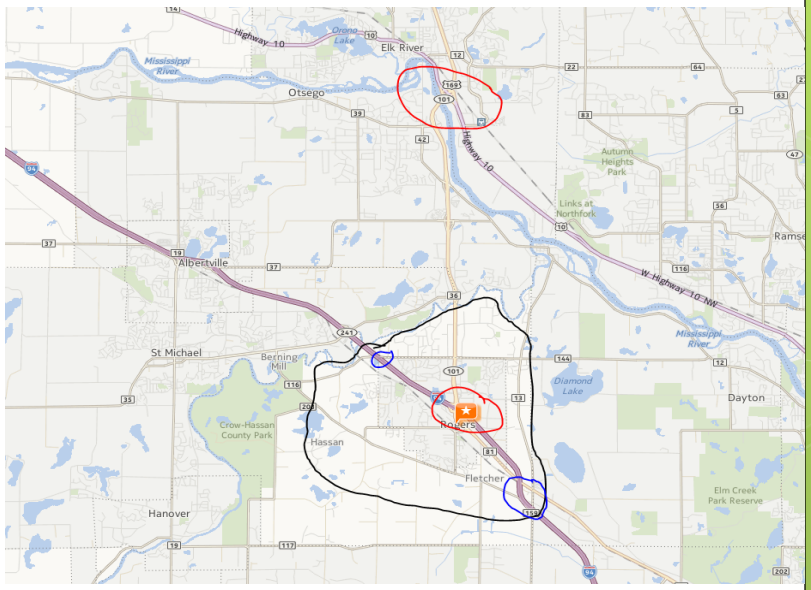
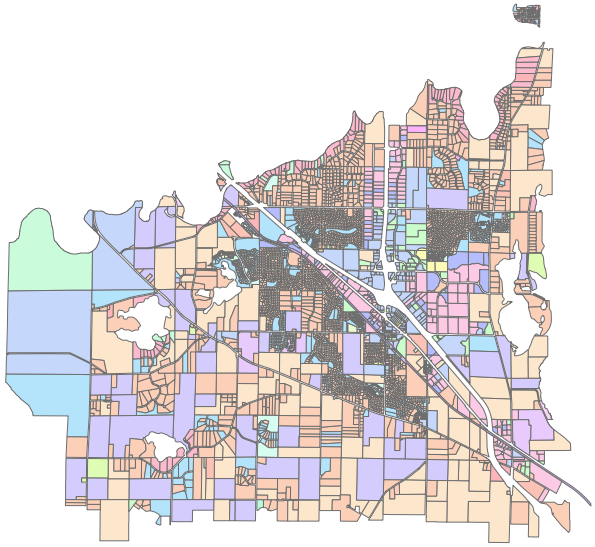


Figure 2 - Rogers Minnesota –
Black: Area Of interest – Red: Access Points – Blue: Potential Access Points

Well?

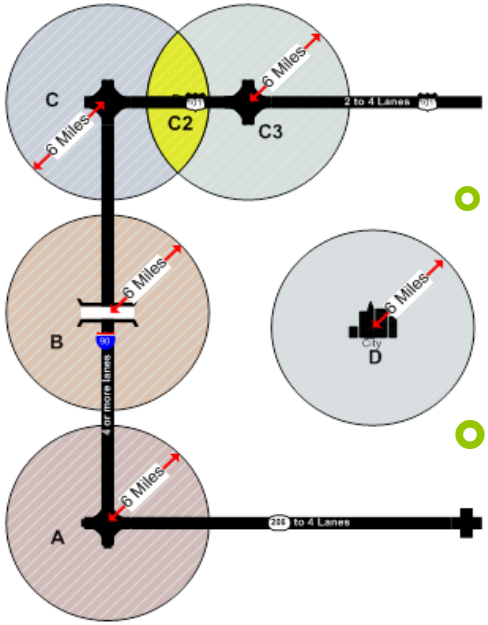
Rogers, Minnesota



- 4,833 Observations
- 69 Fields

Summary

Definition

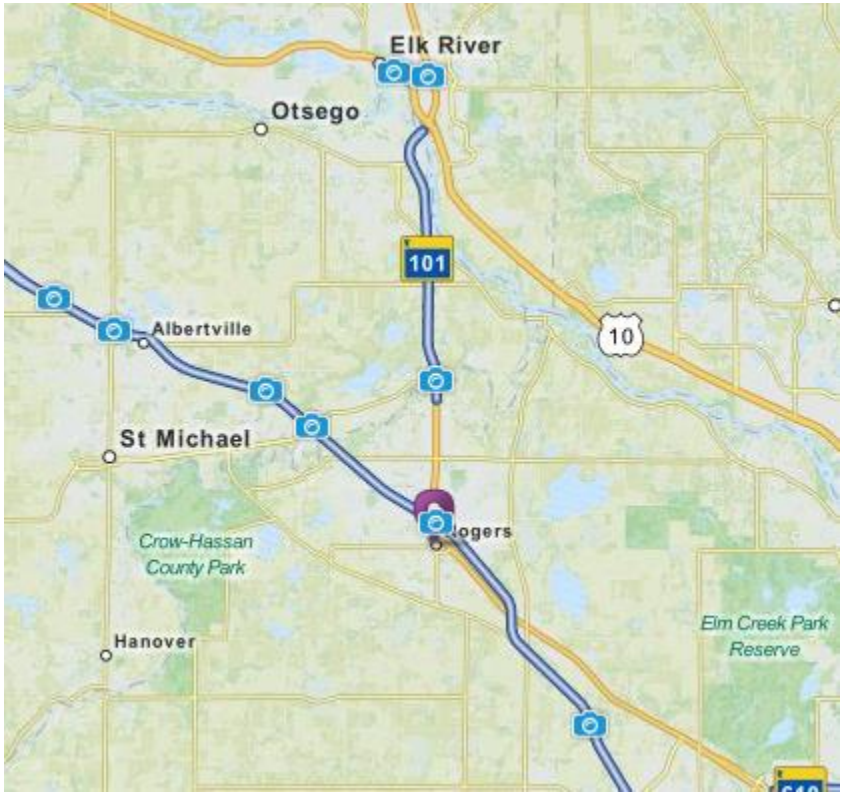


- **No Economic Impact** $H_0: \mu_a = \mu_b;$
  - Difference of growth rate between areas can be explained by sample statistic error only at 90% confidence level
- **Economic Impact** $H_a: \mu_a \neq \mu_b;$
  - Difference of growth rate between areas can**not** be explained by sample statistic error only at 90% confidence level
- μ **is**
  - average growth rates of a particular type of properties in an area
  - Average growth rates is determined by the change of property value estimate based on properties' distance from the interchanges where the distance is the best Manhattan distance with the best travelling time.

Summary

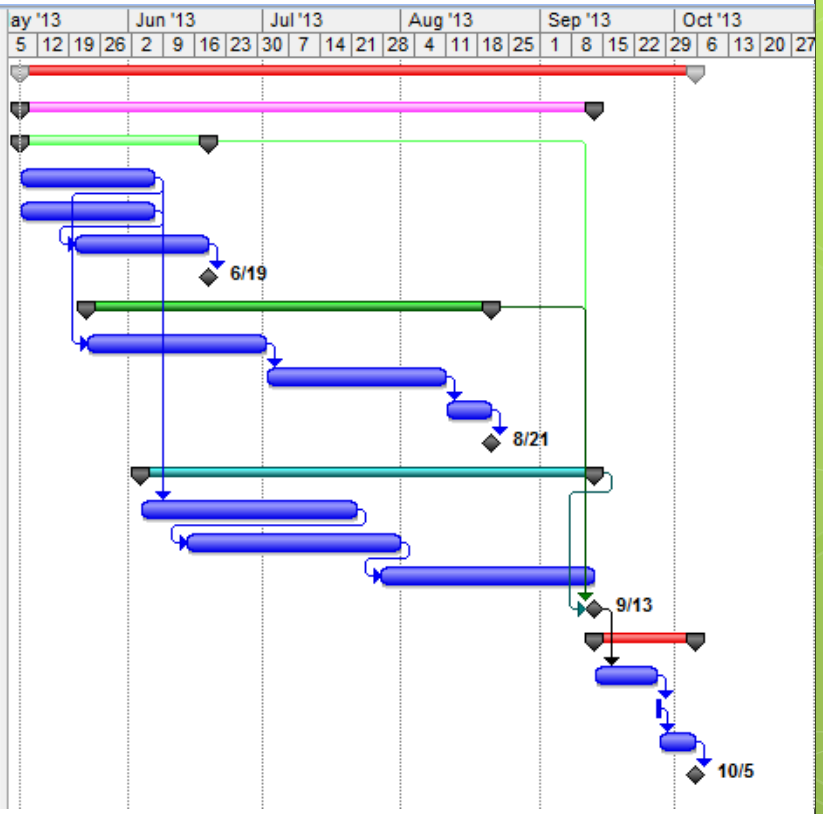
Methodology

- Regression
- Spatial Analysis
- Time Series Analysis
- Hot Spot Analysis
- Overlapping Network and Hot Spot Maps



Time Line

	Task Name	Duration	Start	Finish	P
0	**Master Thesis Completion**	**108 days**	**Wed 5/8/13**	**Sat 10/5/13**	
1	**1 Thesis Phase**	**92 days**	**Wed 5/8/13**	**Fri 9/13/13**	
2	**1.1 Thesis Research Phase**	**30 days**	**Wed 5/8/13**	**Wed 6/19/13**	
3	1.1.1 Thesis Litterature Review	30 edays	Wed 5/8/13	Fri 6/7/13	
4	1.1.2 Spatial Analysis	30 edays	Wed 5/8/13	Fri 6/7/13	
5	1.1.3 Network Analysis	30 edays	Mon 5/20/13	Wed 6/19/13	4
6	1.1.4 Research is complete	0 days	Wed 6/19/13	Wed 6/19/13	5
7	**1.2 Thesis Narrative Drafting**	**64 days**	**Thu 5/23/13**	**Wed 8/21/13**	
8	1.2.1 Rought Draft	40 edays	Thu 5/23/13	Tue 7/2/13	3
9	1.2.2 Editing	40 edays	Tue 7/2/13	Sun 8/11/13	8
10	1.2.3 Completion	10 edays	Sun 8/11/13	Wed 8/21/13	9
11	1.2.4 Thesis Narrative is complete	0 days	Wed 8/21/13	Wed 8/21/13	1
12	**1.3 Thesis Presentation Drafting**	**73 days**	**Tue 6/4/13**	**Fri 9/13/13**	
13	1.3.1 Maps	48 edays	Tue 6/4/13	Mon 7/22/13	3
14	1.3.2 Site Animation (Google)	48 edays	Thu 6/13/13	Wed 7/31/13	1
15	1.3.3 Power Point	48 edays	Sat 7/27/13	Fri 9/13/13	1
16	1.4 Thesis is ready	0 days	Fri 9/13/13	Fri 9/13/13	2
17	**2 Thesis Delivery Phase**	**16 days**	**Fri 9/13/13**	**Sat 10/5/13**	
18	2.1 Meeting Organization	10 days	Fri 9/13/13	Thu 9/26/13	1
19	2.2 Meeting Delivery	0.5 days	Fri 9/27/13	Fri 9/27/13	1
20	2.3 Final Correction	8 edays	Fri 9/27/13	Sat 10/5/13	1
21	2.4 Thesis is Accepted	0 days	Sat 10/5/13	Sat 10/5/13	2



Most Likely

- Most Expensive Residential Lands Away from 94 and 101
- Most Expensive Agricultural Lands Around Potential Access Ramps Development
- Different Property Values Based on Accessibility
- Moderate Causality but Strong Correlation