Spatial Analysis of Iowa State University Student Residences in Ames, Iowa

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CRP 595
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PRESENTATION OUTLINE

• Objective
• Methodology
• Background
• Current Situation
• Future Proposals
• Conclusion
• Limitations and Future Scopes
OBJECTIVE

To identify the vacant lots and propose the location for future student residences

To locate the position of the student residences in Ames and to locate the existing student density nodes (if any)

To locate and identify the facility hubs within the city of Ames

To study the CyRide routes and statistics

To identify the present vacant lots in Ames

To identify the suitable lots for student residential development
METHODOLOGY

Data Collection
- Existing Statistics
- Request to Officials
- Survey and Interview

Literature Study
- Student Housing Locations
- Impacts of Student Housing on community
- Mass Transit and Student Housing

Spatial Analysis
- Current Location of Students
- Identify Nodes
- Identify Changing Density parcels
- Proximity to Campus, Bus Stops, Facilities using Network Analysis

Land use Parcels and Zoning Code
- Identify the vacant parcels, current zoning
- Identify the potential sites for future development
- Take Flood plains into consideration
BACKGROUND

A steady increase in population of Ames, since 2000. **Increased by 5% from 2011 to 2013.**

About **22% of Ames population** consist of ISU students living in **off-campus** locations.

Houses Built since 2000: 6214, about **30% increase**
The most used routes are the Red Route and Blue Route. The rise of ridership has been steady in most of the primary routes, except for the Brown route, where the ridership has increased dramatically.
CURRENT LOCATION OF STUDENTS

Geo-Coded Using ArcGIS online service

Each dot represents one student

A dense pattern was observed in the west of Ames

Evenly scattered along the central and northern parts of Ames

Some of the addresses such as Frederiksen Court, Schilleter Village and University Village were not found by the GeoCoding Service, so was manually Geo-coded.

Total: 14,447 students
Data from ISU records of Fall 2014
Students per acre in the parcels were calculated to find the student density in the parcels.

**Significant clusters mostly in the West Ames.**

Northern clusters are mainly the Housings areas provided by ISU, such as Fredriksen, Schilleter and University Village.

A single significant cluster exists in East Ames

**HIGH DENSITY STUDENT PARCELS**

Spatial Join to find student concentration and clusters
Significant increase of students residences in the West Ames since 2011.

Increase of Campus Housing students at Fredriksen, Schilleter and University Village

New Development near S16th, resulting in significant growth of student residences
Does the current development pattern of student housing in Ames has a drawback?

At what locations should the future student housings be located?
PROXIMITY ANALYSIS

Network analysis Vs Buffer

While a buffer shows the geometrical dimension from a certain point, line or polygon feature, the network analysis shows the accessibility distance through available networks, like streets, metro lines or bus routes.

Also it is possible to relate different networks and accessibility restrictions, including one way traffic through network analysis.

Network Analysis provides a much true picture of accessibility than buffer rings

http://gis.harvard.edu/services/project-consultation/project-resume/census-buffer-analysis-food-proximity
Network analysis

A Network Analysis with Proximity breaks of 3 minutes, 5 minutes and 10 minutes were calculated. These times represent .15 mile, .25 mile and .5 mile respectively. Assumed walking speed: 3.1 miles/hour.

Most of the high density student parcels found near to the campus, with a gradual fade while moving away.
A list of 100 facilities were manually listed and geocoded.

All facilities were not listed if within a close proximity. **The aim was to identify the facility hubs of the city.**

Restaurants, bars, supermarkets, groceries, movie halls, shopping malls and Gas Stations were included in the list.

A Network Analysis with Proximity breaks of **3 minutes, 5 minutes and 10 minutes were calculated.** These times represent .15 mile, .25 mile and .5 mile respectively. Assumed walking speed: 3.1 miles/hour.

Some of the highest density clusters were found to be outside the walking proximity from any facility hub of the city.
All the CyRide stops were analyzed for walking proximity to the student residential hubs.

A Network Analysis with Proximity breaks of 3 minutes, 5 minutes and 10 minutes were calculated. These times represent .15 mile, .25 mile and .5 mile respectively. Assumed walking speed: 3.1 miles/hour.

However, all the CyRide stops cannot be considered as the service is not equal in all the parts.

So, only the frequent CyRide stops were considered for further analysis.
Most of the high density residential fall within the walking proximity of the primary CyRide routes – 1 Red, 2 Green, 3 Blue and 6 Brown.

However the recent development area near the S16th is not served by the primary routes.

The area fall within the service area of the Grey Route, whose frequency in the recent times has been increased, just to serve this residential hub.
A clear anomaly exists in the frequency and the occupancy of CyRide services.

The extreme high number of trips generated by the Route 1A is one of the major concerns.

While the average number of riders in the Grey route is about double that of Red(1A) Route, the number of trips for Grey route is extremely low.
The route lines were generated as proportional symbol mapping depending on the number of trips generated in one day.

The Red route (1A) travelling East from Ames Middle School singularly generates $\frac{2}{3}$rd of the all the trips generated by all the other primary routes.
Locating the vacant parcels was a challenge

No present record was found on vacant parcels

Data was found on the existing structures in Ames

A centroid for all the structures was created and spatially joined with the parcel data to locate the vacant parcels in the city
The vacant parcels found within Ames were again filtered according to the Property classes of the parcels.

The vacant parcels shown excludes the parcels which are exempted by the city zoning code for any kind of construction.

However, all the other parcels with property classes of industrial, residential, mixed use, agriculture and Government/School owned typologies have not been excluded from the shown map.
A major area of Ames constitutes of the flood zones.

Generally constructions are not preferable in the flood zones.

However, constructions are not impossible in such areas, it requires a lot of money and engineering.

If found enough reasons, the outer fringes of flood zones, (marked in orange shade in the adjacent map) can be developed by raising the built platform through landfilling.
DRIVING PROXIMITY

Assumptions Used

All Roads considered as two-ways as no current data is available in more details

Average driving speed is assumed to be 35 mph

Traffic Signals and Stop Signs were associated with route segments, as per existing data

No traffic data is considered, hence time of day is insignificant

A time barrier was set as 15 seconds for the traffic signals and 10 seconds for stop signs
The proximity analysis was done with break intervals of 3 minutes, 5 minutes and 10 minutes.

The *vacant parcels within each of the time zones were spatially joined* to understand their proximity from the central ISU campus.

8 points were considered at the periphery of the central campus for the sake of calculation.

Most of Ames is traversable within a 10 minute time barrier from the central campus.
WEIGHT SYSTEM

- **Accessibility to CyRide stops given the most potential**
- **Driving Proximity to campus given the second most vital potential**
- **Walking Proximity to Amenities given considerable potential**
- **Parcels is flood plains given a considerable negative weight owing to the engineering and environmental problems associated with it**

<table>
<thead>
<tr>
<th>Features</th>
<th>Weights</th>
<th>Variable/Constant</th>
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<tbody>
<tr>
<td>Proximity to Campus</td>
<td>4</td>
<td>1 to 3</td>
</tr>
<tr>
<td>Walking Proximity to Amenities</td>
<td>3</td>
<td>1 to 3</td>
</tr>
<tr>
<td>Walking Proximity to CyRide Routes</td>
<td>10</td>
<td>constant</td>
</tr>
<tr>
<td>Floodways</td>
<td>-15</td>
<td>constant</td>
</tr>
</tbody>
</table>

As there are almost no vacant parcels in the walking proximity to the central Campus, it was not included in the search for potential parcels.
The map shows the parcels with a potential of developing future student residences. Also, the CyRide routes show the current load on the trips generated.
3 Areas with one or more vacant parcels were identified within the recommended parcels.
The Priority 1 parcel is located to the near west of the central campus. Its location and current residential zoning as Residential makes it a preferable parcel for development. Also it is at a near proximity to the central campus (1 mile) and walking proximity to the facility hub (.5 miles) at Lincoln Way near West Hyvee.

The Red 1A route runs about 6 buses at an interval of 2 minutes in the morning. The proposal is to split up the number of buses running the current longer route.

The proposed route will save a distance for 1 mile for every trip.

PROPOSALS
Reroute Bus 1A to decrease load and serve proposed site (if developed)
The vacant clusters at 2 also have high potentials for future development. Though most of the small lots could be developed as family dwellings, the large triangular lot, accessible to the Blue Route provides a promising potential. Also it is at a near proximity to the Facility Hub of North Grand Mall, which area is in need of more customers.

Some of the vacant lots at 3 are currently under construction and it is believed that they will help to improve the Grey route for CyRide.
CONCLUSIONS

Does the current development pattern of student housing in Ames has a drawback?

Yes,

There is unequal load on only one route of CyRide.

The most dense student clusters are not within walking proximity of facility hubs. The businesses might be getting adversely affected by this fact.

At what locations should the future student housings be located?

Other than the above recommended parcels for student development, it is to be considered by the city officials about the location of the future developments, so that no more load be increased to the sole route of 1A
LIMITATIONS AND FUTURE SCOPES

Too much development has been already done

A detailed data on the rents of the housings available in the different parts of the city could have helped the analysis.

A detailed data of the students using cars can throw some more light about the student residences’ proximity to different facilities and the University.

The commute pattern and commute choices of the students should be analyzed to help improve the efficiency of CyRide.

An online survey and interviews with CyRide officials and Property managers will be the next step of the study.
THANK YOU

QUESTIONS