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SP 2021 GIS 5577: Project Proposal

**Comparing Bike Share and Motorized Scooter Usage in Minneapolis, MN**

**Introduction**

Micromobility has become increasingly popular worldwide in recent years (Galatoulas et al. 2020, Oeschger et al. 2020). Its ability to solve the first and last mile transportation holds promise for an integrated transport system with multiple economic, social, and environmental benefits (APTA 2021, Oeschger et al 2020). Micromobility can be defined as “the use of micro-vehicles: vehicles with a mass of no more than 350 kg(771 lbs) and a design speed no higher than 45 km/h (ITF 2020). Examples of micro-vehicles are bikes and electric scooters.

In Minneapolis, MN bike-sharing and e-scooters have gained popularity. In 2018, Minneapolis launched a scooter share pilot with 2500 scooters available for use and has continued this program since. Scooters utilize the same rules as for bikes; scooters must be operated in bike lanes or with traffic and parked and locked at racks or nearby signposts (City of Minneapolis 2020). Unlike bikes, scooters are electrically powered and must be recharged. However, both micro-vehicles require infrastructure like bike lanes for routes. This study aims to compare the usage of bike and e-scooters. Specifically, are bike sharing and scooter sharing complimentary or competing with one another based on their usage and travel patterns. Furthermore, because micromobility increases accessibility, this study will also examine the demographics (race and median income) of where trips are occurring to infer who may be using the micro-vehicles most and compare end trips to existing bus transit stops.

**Methods**

* Data
  + Nice Ride trips: <https://www.niceridemn.com/system-data>
  + Motorized Scooter trips: <https://opendata.minneapolismn.gov/search?q=scooter>
  + 2010 US Census data: [US Census](https://data.census.gov/cedsci/advanced)
  + 2010 US Census boundaries: [MN Geospatial Commons](https://gisdata.mn.gov/dataset/us-mn-state-metc-society-census2010realign)
  + Metro Transit Stop locations: [MN Geospatial Commons](https://gisdata.mn.gov/dataset/us-mn-state-metc-trans-transit-stops)
  + Minneapolis Boundary: [Minneapolis Open Data](https://opendata.minneapolismn.gov/datasets/89f1a70c0cf24d7692e2d02fdf8f4e47_0?geometry=-93.783%2C44.886%2C-92.740%2C45.056)
* Data clean and preparations
  + Aggregate monthly data to annual
  + Separate dockless with dock trips from both bike share and scooter share datasets
  + I believe all e-scooters are dockless. Identify docks for bike shares using the start location.
  + Calculate demographic ratios.
* Comparison analysis
  + Cumulative travel distance from all trips
  + Usage by day and time.
    - Group trips by day of week and hour of day. Calculate average counts for each dataset.
    - Calculate average distance traveled for each trip.
    - Calculate average time spent for trips for each mode micromobility.
  + Start and end point overlap.
    - Find matches in start points.
    - Find matches in end points.
    - Create heat map and identify hotspots for start and end points.
* Accessibility analysis part 1
  + Join start point of trips with census blocks or block groups.
  + Get counts of trips for each unit.
  + Buffer transit stops and get counts of start trips/end trips.
    - Can potentially portray this by overlaying transit stops with heat map.
* Accessibility analysis part 2
  + Network analysis based on bike lanes and starting points the service area for e-scooter and bikes.

**Expected Results**

* Map showing potential service areas of bikes and scooters in Minneapolis.
* Comparison statistics (avg trip distance, avg trip time, total mileage for each micromobility method)
* Comparison bar graph with usage (y) and days of week (x).
* Heat maps of starting points and ending points for bikes and e-scooters (4 total)
* Maps showing race and income demographics with graduated symbol of start point usage.
* [For ending trips compared to bus stops, I’m not sure how to portray that one yet]

**Timetable**

Table 1. Estimated timeline for project analysis and paper.

|  |  |  |  |
| --- | --- | --- | --- |
| **Project Outcome** | **Paper Outcome** | **Projected start date** | **Projected completed date** |
| Load data into database | Introduction | 2/23/21 | 3/7/21 |
| Clean data and create tables based on conceptual schema design. | Database Shema | 2/28/21 | 3/16/21 |
| Calculate statistics for bikes | Update methods | 3/7/21 | 3/13/21 |
| Calculate statistics for scooters | Update methods |
| Accessibility analysis pt 1 | Update methods | 3/14/21 | 3/21/21 |
| Accessibility analysis pt 2 | Update Methods | 3/21/21 | 3/28 |
| Finish any analysis that were not completed | Update Methods | 3/28/21 | 4/4/21 |
| Create visualizations (graphs and maps) |  | 4/5/21 | 4/18/21 |
|  | Methods | 2/28/21 | 4/18/21 |
| Project Presentation | Data Analysis | 4/19/21 | 4/24/21 |
|  | Challenges and problems | 4/25/21 | 5/2/21 |
|  | Solution database provided |
|  | Edit Final Paper | 5/3/21 | 5/9/21 |
|  | Final Paper completed | 5/9/21 | 5/9/21 |

**References**

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City of Minneapolis. (2020) Motorized foot scooters. City of Minneapolis. http://www2.minneapolismn.gov/publicworks/trans/WCMSP-212816

Galatoulas, N., Genikomsakis, K.N., and Loakimidis, C.S. Spatio-temporal trends of e-bike sharing system deployment: a review in Europe, North America and Asia. *Sustainbility*12(11), 4611.

ITF. (2020). Safe Micromobility. Report by the International Transport Forum OECD/ITF.

Oescheger, G., Carroll, P., and Caulfield, B. 2020. Micromobility and public transport integration: The current state of knowledge. Transportation Research Part D 89, 102628.