ANALYZING STUDENT TRAVEL PATTERNS WITH AUGMENTED DATA VISUALIZATIONS

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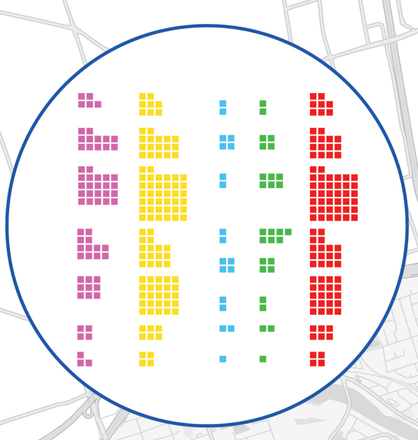
Abstract

Visualization and visual analytics tools can provide critical support for experts and stakeholders to understand transportation flows and related human activities. Correlating and representing quantitative data with data from human actors can provide explanations for patterns and anomalies. We conducted research to compare and contrast the capabilities of several tools available for visualization and decision support as a part of an integrated urban informatics and visualization research project that develops tools for transportation planning and decision making. For this research we used the data collected by the StudentMoveTO (Toronto) survey which was conducted in the fall of 2015 by Toronto's four universities with the goal of collecting detailed data to understand travel behaviour and its effect on the daily routines of the students. This poster discusses the usefulness of new software which can allow designers to build meaningful narratives integrating 3D representations to assist in Geo-spatial analysis of the data.

Research

The team conducted an analysis of the survey data using two different exploratory data visualization software (StoryFacets and Betaville's WebGL) applications. (1). The data analysis undertaken with both platforms was framed by a key question

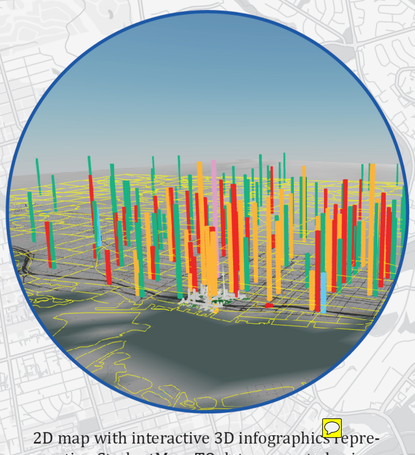
What data visualization types best represented the salient information?



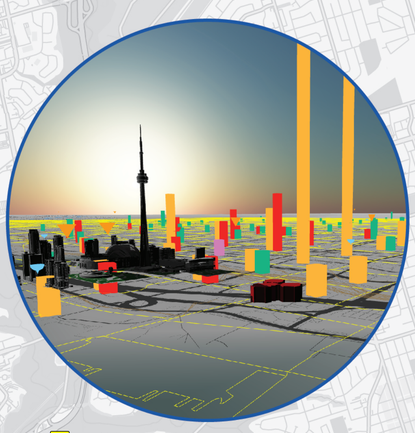
A representation showcasing infographics that can be generated using StoryFacets

StoryFacets can be used to provide bar chart, pie chart and scatterplot visualizations

3D model of City of Toronto being generated at OCADU Visual Analytics Lab to assist further study on transportation and transit behaviours



2D map with interactive 3D infographics representing StudentMoveTO data generated using Betaville



3D visualization generated in Betaville gives a spatial understanding of the data, therefore enhancing its qualitative dimension

StoryFacets

Is a data analytics dashboard, providing data analysis and communication through interactive infographics that can be arranged in narrative sequences. StoryFacets is an exploratory data analysis and presentation tool which integrates data loading, provenance analysis, qualitative markdown content, an interactive infographics dashboard, and dynamic presentation options.

Betaville

Is an interactive web based 3D geo-visualization tool. Betaville displays commute distances, types and volumes to represent real-world commuting experience of transit users in the Greater Toronto Area. Betaville generate infographics as an overlay on the map to support the institutional and city agency decision-makers to plan for change.

Results

StoryFacets allowed users to construct a narrative by connecting data in a sequence, which then helped identify patterns and relationships. The addition of Betaville to StoryFacets provided additional clarity and narrative capability. Users were provided with a clear understanding of different commute patterns. The visual representations revealed important patterns of clustering and the relative scales of the ranges of the different modes of commuting. They also helped users interpret quantitative data by relating numbers to their meaning: different lived experiences of commuting.

Conclusions

The integrated use of StoryFacets and Betaville succeeded in providing insight for users at various scales; from the focus of an academic institution to scale of the large metropolitan area. At the larger metropolitan scale, the visualization of data provided information that aided in decision making; in particular, with the tradeoffs that students make regarding housing location and transportation. Our research suggests that analysts made more discoveries by combining a 2D system (that allows fast queries), tracing the provenance of decisions and visualizing distances and volumes using a 3D system, rather than using conventional or "heat map" infographics. StoryFacets and Betaville can support collaboration between novice and expert users. Qualitative insights derived from to users' comments were placed against the quantitative data to assess veracity and further an understanding about the transportation and commuting behaviors. In addition, the portability and cross-platform compatibility of both StoryFacets and Betaville supports distributed collaboration.

Further Research

Technology: We will (i) continue to develop effective ways to represent data in 3D and 4D cartography, (ii) conduct usability tests of the Betaville prototype, and (iii) incorporate our research approach with professional 3D platforms such as Esri's CityEngine (2).
Analysis: We will develop the ability for Betaville users to visualize "time scale" factors, allowing for clustered narratives to be revealed within specific time frames (ie. the relationship between optimal travel time and the location of affordable student housing). We will develop immersive "fly-through" experiences.
Users: We will ensure the interface serves the needs of transit analysts and university administrators, while providing students with tools in order to help them (i) plan where to live, (ii) understand transportation options, (iii) make curriculum choices (which factor in work and childcare needs).

References

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Acknowledgements

The authors gratefully acknowledge the support of the Ontario Ministry of Research & Innovation through the ORF-RE program for the iCity Urban Informatics for Sustainable Metropolitan Growth research consortium; IBM Canada, NSERC Create-DAV, and MITACS for support of graduate and post-doctoral research; Esri Canada and MITACS for support of graduate internships; Michael Carnevale at the OCADU Visual Analytics Laboratory for asset design and development work with Betaville; Artjem Disterhof and Martin Koplin at the Media2Culture (M2C) Institut für Angewandte Medienforschung at the University of Applied Sciences of Bremen for development work on the Betaville prototype.