Automating Campus Transportation Monitoring - Executive Summary

David Stonham

University of British Columbia

CIVL 202

December 04, 2015

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Context

In their recent Transportation Plan, UBC Campus and Community Planning (C+CP) committed to implementing a comprehensive transportation monitoring program in order to inform future policy and development decisions on the UBC Vancouver campus (C+CP, 2014). Of particular importance in a monitoring program, is fine scale patterns of mobility among pedestrians and cyclists, since C+CP have prioritised them for being sustainable transportation options.

Through the following poster presentation, I seek to identify the current state of knowledge with respect to transportation monitoring and human mobility tracking and at UBC, present this state of knowledge in a clear manner, and provide recommendations for further studies in the development of the monitoring program.

Methods

This state of knowledge has been synthesized from a number of sources. Firstly I reviewed the outcomes of the my first SEEDS project on Campus Transportation Monitoring, a feasibility assessment of using GPS technology to track individuals movements across campus. This pilot study was carried out in 2014 and documented in the report entitled "Enhancing Campus Transportation Monitoring (Stonham, 2014). Secondly, I conducted a telephone interview with members of staff at C+CP to revisit the conclusions of the pilot study and highlight areas where improvements could be made. Finally, I reviewed (the participant side) of an existing study, which uses a web based API, set up by the University of Washington, as this study has many features that would be applicable to a UBC monitoring program.

Conclusions

Through this poster, I present two concrete recommendations for steps that C+CP can implement next in their development strategy for a monitoring program. Both recommendations involve further research into technologies that could be scalable to a campus wide, ongoing transportation monitoring program at UBC.

1. Explore in more detail using a web based API technology to allow study participants to record details of their routes retrospectively on an online map. Evaluate the pros and cons of this method.
2. Conduct a second feasibility assessment into GPS tracking using a mobile application rather than a custom GPS Data Logger as used in the 2014 feasibility assessment.

Additionally, I would suggest that both of these lines of inquiry could be evaluated by students working through the SEEDS program in tandem with C+CP staff.

David Stonham
UBC SEEDS Program

UBC Campus Transportation Monitoring

Context: This poster presentation furthers research into monitoring methods for human mobility patterns at the University of British Columbia (UBC). Here, I synthesize existing work, clarify key aspects of a study, and provide examples of existing technology. I identify ***two suggestions*** for Campus and Community Planning (C+CP) to aid the successful implementation of an ongoing and comprehensive monitoring program to aid operational decisions impacting the sustainability of the campus for years to come.

Transportation Planning

Tracking fine scale transportation patterns across the campus is a powerful and essential tool for data based policy decisions. In their Transportation Plan, C+CP committed to implementing a transportation monitoring program (C+CP, 2014). Transportation planning, and the correct implementation of monitoring technology can be considered as a form of Engineering for Sustainability.

aids / using

Available Resources

Time and money are a precious resource and must be used efficiently. Finite resources necessitate a trade off between scale and quality of a study.

requires

Efficiency

Designing a study to use resources sparingly whilst being large enough in scope to gather data that may be useful or required in the future.

learning from

Pilot Study

In the Fall of 2014 a pilot study was carried out to assess the feasibility of using GPS Loggers to track individuals as they travelled across the campus. While the results of the 10 person study were eye opening, particularly when establishing the importance of route data in preference to point data, the technology had several limitations. The study could not be scaled due to the large cost of equipment and quantity of data to process. The Data Loggers also did not provide a concrete means of recording the mode of travel, something which C+CP is very interested to find out. (Stonham, 2014)

through

Automation

In order to scale the study and process a large quantity of data the process needs to be streamlined and automated wherever possible.

determine

Complexity

A detailed study will provide a bank of data from which inferences can be made in topics not originally considered.

Scale

Larger temporal and geographical scale of a study will increase costs.

Participation

The more people involved in a study the closer the results reflect the population.

increases / lowers

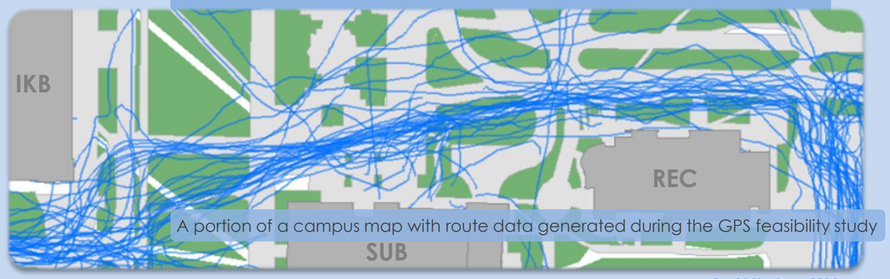
Sustainability

C+CP prioritise walking and cycling over other forms of transportation both to and from campus and within it(C+CP, 2014). Effective cycling and pedestrian infrastructure play an important role in achieving this result in addition to an extensive public transportation system and personal decisions of an informed public.

demands

Mode Share

Understanding how people use and occupy space is important for allocation of rights of way and can prompt appropriate changes to infrastructure and encourage sustainability.



A portion of a campus map with route data generated during the GPS feasibility study

David Stonham, 2014

Route Data

Following a participant's path facilitates an understanding of how and why different parts of the campus are connected and provides the opportunity to re-enforce these links in the community.

over

Point Data

The collection of data from discrete locations across campus can assist with isolated projects, but lacks the connectivity required for a whole system approach.

gathered by

GPS Tracking

Using satellite tracking proved to be a useful tool for gathering accurate data, but the tech we used lacked the scalability required for a full scale study. processing the data was the largest hurdle as each track was manually checked and cleaned of errors.

like

Web Map API

Another means of getting route data without GPS receiver. Study participants manually enter information on their routes retrospectively and online. **The pros and cons of this method should be explored thoroughly by C+CP.**

U of Washington "My Places"

The University of Washington (UoW) Office of Planning + Budgeting (OP+B) created the "My Places" survey using a map API as part of a Campus Landscape Framework Plan, to "guide the development and stewardship of the campus landscape over the next 20 years." (University of Washington, 2015)

using a

aim for / leads to

Statistically Significant

A study just large enough to interpret meaningful results without adding cost.

Bias

The demographic, of participants, how they are selected, and the technology they use will introduce bias.

explain when

Reporting

The UBC campus is thriving with enthusiastic students looking for data. By making the results of a study available, student projects will benefit from reliable data.

integrate

Mobile App

Many students not only own, but carry a device that runs readily accessible GPS and mapping software. **C+CP should fully investigate this option by means of a second feasibility assessment.**

and

Energy Demand

The more people are encouraged to walk or bike, the less energy is used in moving people to, from, and around campus. Additionally, with proper monitoring and data driven policy, energy (and materials) invested in maintaining the public realm will be used in the most efficient manner.

Public Safety

By learning when and where students choose to walk and bike, safety can be improved with measures such as street lighting, improved crosswalks and dedicated rights of way.

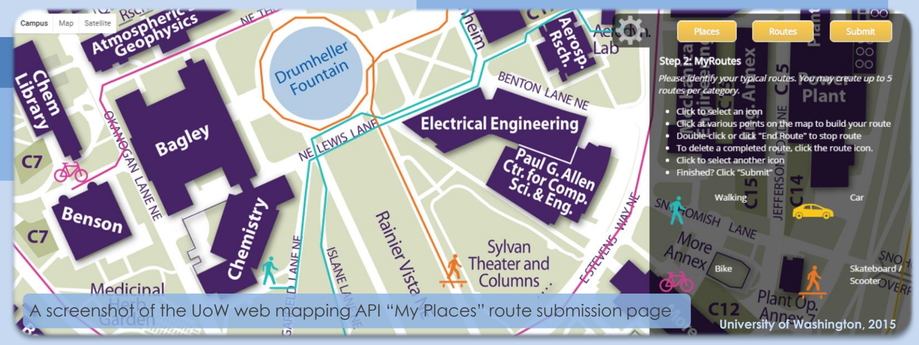
"Desire Lines" criss-crossing the campus are designed to let pedestrians walk precisely in the direction they want to travel minimising trip lengths and maximising the pleasure of walking.

David Stonham, 2014

Evaluation of Sustainability of "My Places"

Although the framework originated from the Mining and Minerals industry, by asking the "Seven Questions for Sustainability" (CIVL 200, 2015) we can determine whether this operation's "net contribution to sustainability is positive over the long term:

1. ***Are engagement processes in place and working effectively?***
   The project itself is a tool for enhancing the quality of public engagement.
2. ***Will people's wellbeing be maintained or improved?***
   The initiative should result in implementation of projects more targeted to the needs of the campus and those who use the space.
3. ***Is the integrity of the environment assured over the long term?***
   Reductions in energy used for transportation and the correct investment in infrastructure will reduce the negative impact the campus has on the environment.
4. ***Will the economy of the community be better off as a result?***
   The potential benefits and cost savings that could result from accurate, relevant information far outweigh the costs of implementing the study.
5. ***Are institutional arrangements and governance in place to address project or operational consequences?***
   Not only is there demonstrated capacity to set up the study, but the project provides feedback precisely for aiding operational decisions.
6. **Are traditional/non-market activities accounted for appropriately?**
   In the absence of specific details and without reviewing the process by which this study came about, I cannot fully evaluate this point.
7. ***Does a synthesis show a net positive result in the long term?***
   By learning about connectivity and flow the UoW OP+B can make decisions based on real data to enhance the sustainability of the campus.



A screenshot of the UoW web mapping API "My Places" route submission page

References

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David Stonham
for CIVL 200
on Dec 4, 2015