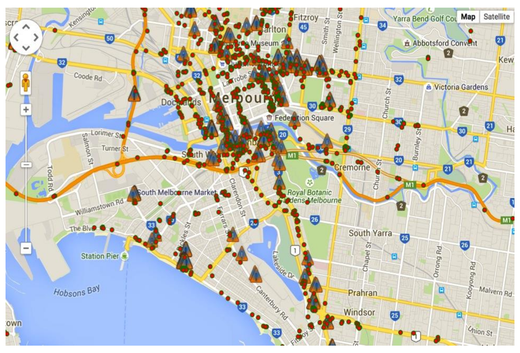

Fig 3a. Using Social Media to Identify Amount of Traffic on the road.

THE UNIVERSITY OF MELBOURNE

Project Green

Prof. Richard O. Sinnott

Arjun Chaudhary

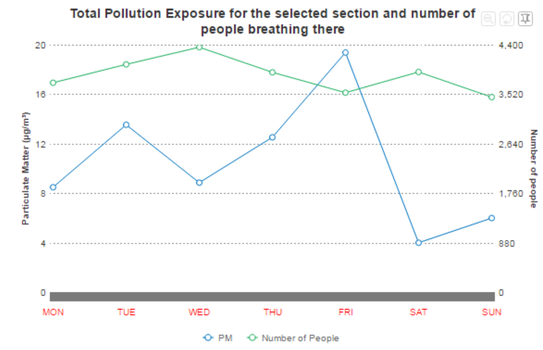

Fig 5. Using Social Media to Identify the effect of pollutant on people.

Introduction

Communicating the benefits of intangible things is inherently difficult. In the same way that quantifying benefit are inherently difficult in a spatially heterogeneous and complex system like an urban landscape. We all acknowledge the cooling benefits of trees and parks exist, but how great is the benefit? When and where are the benefits greatest? Similarly, how great are other noise and pollution reduction benefits? An intelligent network of environmental sensors throughout the grey and green space matrix of the urban landscape will provide a means to communicate to the general public and policy-decisions makers the less tangible benefits that trees and green space provide.

The City of Melbourne leads the way in Australian in the education, engagement and empowering of residents, workers and visitors in the benefits provided by our urban trees and green space. A key innovative success has been the web-based Urban Forest Visual Map through which the general public has engaged in precinct planning and emotional outlet through the 'Email a Tree' phenomenon that led to poems and even letters of love. The City of Melbourne hopes to deepen this engagement through collaboration with the University of Melbourne in the 'Education Precinct' we that be both manage. This project proposes to establish a 'Network of Trees' in streets and green space linking measurements of temperature, humidity, noise and air quality in 'real-time' to the Urban Forest Visual Map. This project will lead to education and engagement of University students and staff, as well as Melbourne's residents/workers and visitors, as to the environmental benefits that urban trees and green space provide.

Method

This project will establish a first wave of a sensor network through the University Precinct to demonstrate research potential, public education and engagement, and social communication to promote activity and nature awareness. This project will establish a first wave of a sensor network through the University Precinct to demonstrate research potential, public education and engagement, and social communication to promote activity and nature awareness. At University Square a network of 9 climate stations will be installed and linked to the UniMelb server through wireless communication. These will continuously monitor climate from which human thermal comfort can be estimated a) under tree canopies, b) above turfed grass and c) in the paved plaza. In addition, a network of 45 Citizen sensors will be distributed from University Square to Lincoln Square to Cardigan gardens, finishing at Carlton Gardens. Thirty sensors will be placed under trees in streets and parks, and 15 sensors will be placed in streets and plazas without direct tree shade or green space benefit. These Citizen sensors will continuously monitor air temperature, relative humidity, noise levels, light levels (LuX) as well as carbon monoxide (CO) and nitric oxide (NOx) concentrations. This data will be channelled through a LoRaWan Gateway at University Square to the internet and streamed into the AURIN research data platform. This will provide a unique data layer that includes numerous other data sets (traffic, population profile, building footprints). This data aligns with future capabilities demanded of AURIN for real-time data analytics. Simultaneously, this data will be linked to spatially discrete indicators of environmental benefit on the City of Melbourne's 'Urban Forest Visual Map'.

Innovation

The project is innovative in the application of available technology to provide a real-time and easy-to-understand representation of nature's worth and environmental benefit within our shared urban landscape. Networked environmental sensors already exist internationally, but not in Australia in an urban context. This project platform is innovative and ambitious in the development of a freely accessible real-time environment data and the communication of that data to the widest possible public community of interest through innovative web-based and real-time communication methods.

Project Outcome

There are three key outcomes from this project:

1) An interactive environmental network of sensors throughout the university precinct available to teaching AND research purposes regardless of discipline background – the data is freely available to all.

2) A benchmark data archive of environmental conditions throughout the University precinct against which the impact of development, transport and climatic change can be tracked over the long term. This will be archived within AURIN and will be of widespread interest. Highly disaggregated indicators of environmental quality in localized context of specific interest to the City of Melbourne, State government and the University itself.

Health category	24-hour $PM_{2.5}$ µg/m3
Low	0–8.9
Moderate	9.0–25.9
Unhealthy – sensitive	26.0–39.9
Unhealthy – all	40.0–106.9
Very unhealthy – all	107.0–177.9
Hazardous (high)	Greater than 177.9
Hazardous (extreme)	Greater than 250

Fig 6. Seven categories for smoky air.

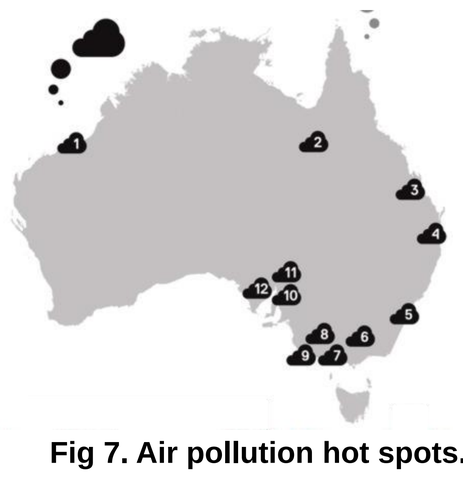

Fig 7. Air pollution hot spots.

3) A widely publicized and open-access example of University cross-disciplinary real-time research in collaboration with industry (City of Melbourne) to engage Melbourne's society in urban environmental awareness.

Results

What we have achieved till now:

1. As shown if Fig1 we can find out pollution exposure for a person and in what area it was extreme.
2. We can also analyse amount of exposure to a person on weekly and daily bases as shown Fig 2a and Fig 2b.
3. Using twitter data (Fig 3a and Fig 3b), we can find out number of cars in an certain area attributing to high pollution level as shown in Fig 4.
4. Using pedestrian system Fig 5 we can find out number of pedestrian affected by pollution in CBD.

Fig1. Heat map showing the pollution exposure for certain individual.

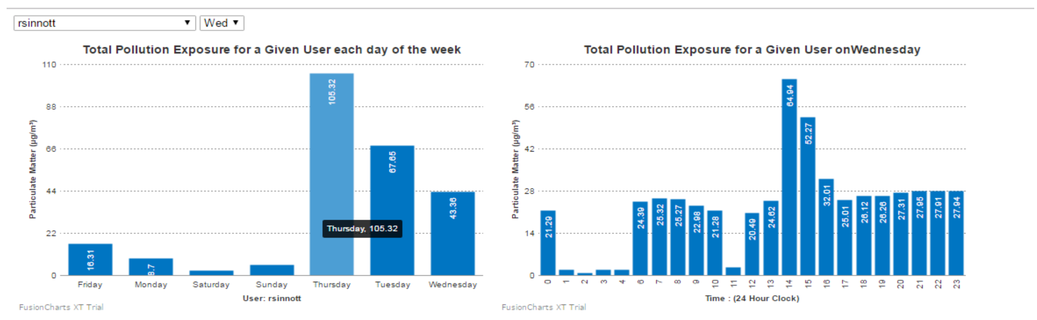

Fig 2a. Weekly pollution exposure for a person.

Fig 2b. Daily pollution exposure for a person.

Fig 3b. Selecting a part of user journey on a live map.

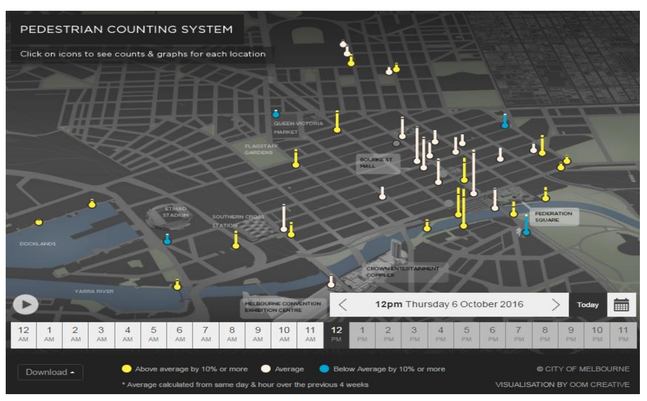

Fig 4. Pedestrian count in CBD.

Future Resourcing

The success of this project will be used as a template to drive for ARC competitive funds, and other government and industry-based funding (e.g. HIA Green Cities Fund) to deploy similar research and environmental education networks in green-field communities in Victoria and other Australian states. In these newer suburbs, developing a connection to nature and greater awareness and amenity use of green space and treed landscapes is a real human health and society issue right now and for the future.

Contacts

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