

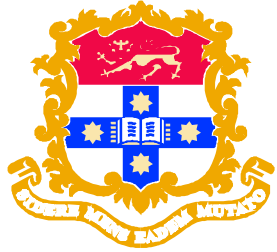
# Using GPS Multi-Day Data to Model Activity Choices

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Sydney

Prepared for

“The Joy of the Journey: Celebrating the  
Life and Work of Ryuichi Kitamura”

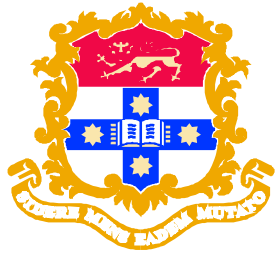
UC Davis, 29-30 June 2009



# Some Personal Reminiscences



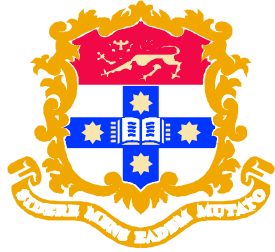
- Met Ryuichi first in 1977 at TRB
- Ryuichi rapidly rose to prominence in the field of travel behaviour – meteoric
- Became the fourth chair of the TRB Committee on Traveler Behavior and Values ten years later
- Also became the chair of IATBR



# Some Personal Reminiscences



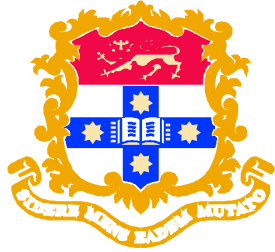
- Rapidly became one of the leaders in the field
- As others have already mentioned – early recognition of the importance of activities
- Early proponent of microsimulation
- Many other firsts from Ryuichi



# Ryuichi's Legacy



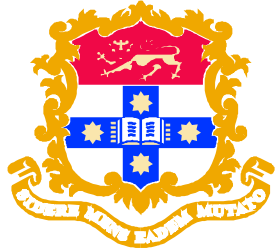
- First to consider activity perspectives instead of trips in travel behaviour research (1983)
- First to conduct activity-based modelling and activity-based analysis (1984)
- First to use the activity diary to study travel activity (1990s)
- ...



# Some Ongoing Work at ITLS



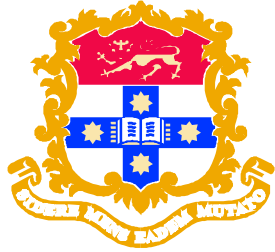
- The following presentation describes some work in progress and not far developed yet
- Looking at some new opportunities to develop activity-based, tour-based models
- Using recent and current/future data collected for other purposes



# GPS Data



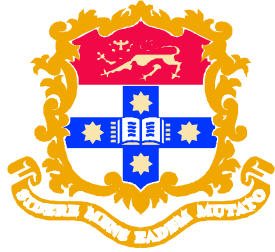
- ITLS has been collecting GPS data for several years
- Major data resource currently is three to five years of panel data from a panel of 200 households
- Respondents carried devices for 7 days (a subsample used devices for 28 and 15 days)



# GPS Data



- One GPS device was provided to each person in the household over the age of 14
- Data were also collected on:
  - Person and household characteristics
  - Public transport routes
  - Public transport stops
  - Land use by parcel
  - Addresses of:
    - Workplaces
    - Schools
    - Two most frequently-used grocery stores

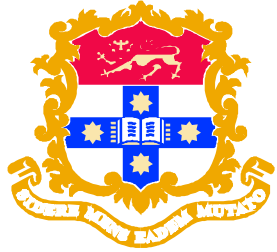


# GPS Data



- A second study collected data from 50 households for 28 days
- ITLS processing software first splits the traces into trips
- After splitting into trips, there is a visual process of map editing
- After the visual check, the data are further processed to identify mode and purpose

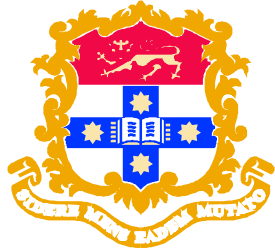




# Mode and Purpose



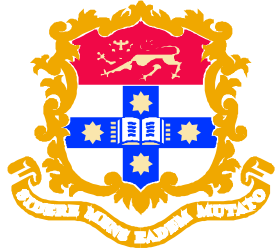
- Mode is identified using attributes such as
  - 85<sup>th</sup> percentile speeds
  - Rates of acceleration and deceleration
  - Physical location of the trace, relative to streets and rail lines



# Mode and Purpose



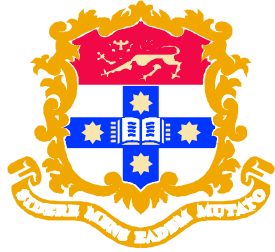
- Purpose is identified using attributes such as:
  - Collected addresses
  - Land use data in GIS format
  - Frequency and duration of visits



# Probability



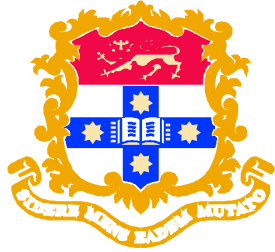
- Past modelling has been based on a one-day snapshot of behaviour
- This has required the use of models that can use binary data to produce probabilistic models
- Multi-day data provide the opportunity to estimate observed probabilities



# Dynamic Data



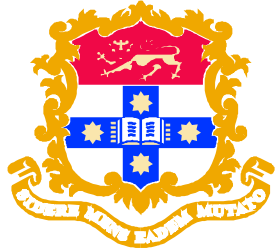
- Not only do these data provide multi-day observations
- They also provide longitudinal panel data
- Opportunity to look for variation by day and year by year



# One Wave of Data



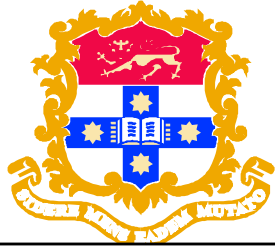
- Using the 28-day data from just one wave in 2006, we have the following statistics:
  - 47 Households
  - 89 Respondents
  - 1,515 person days of travel data (including no travel days)
  - 1,043 daily travel tours
  - An average of nearly 12 tours per respondent



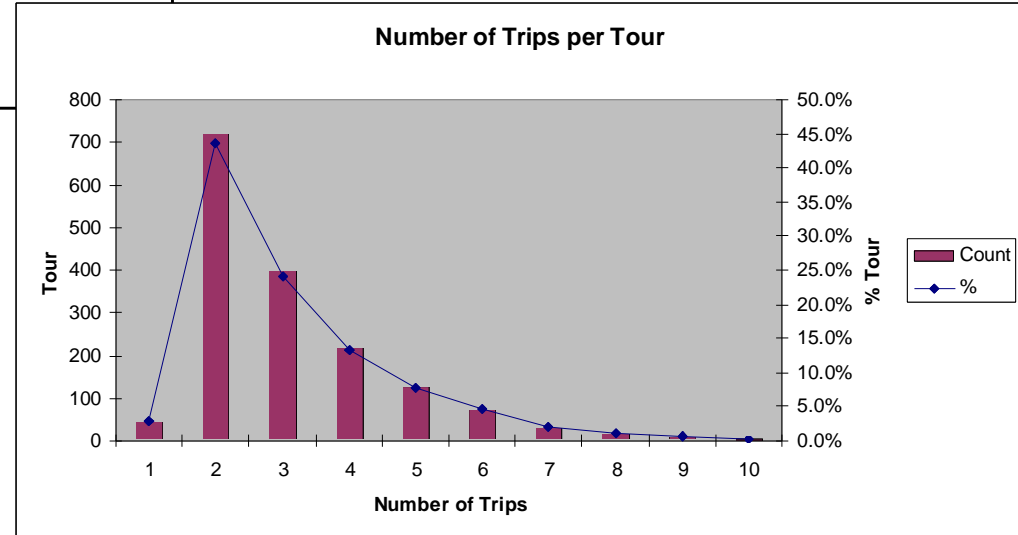
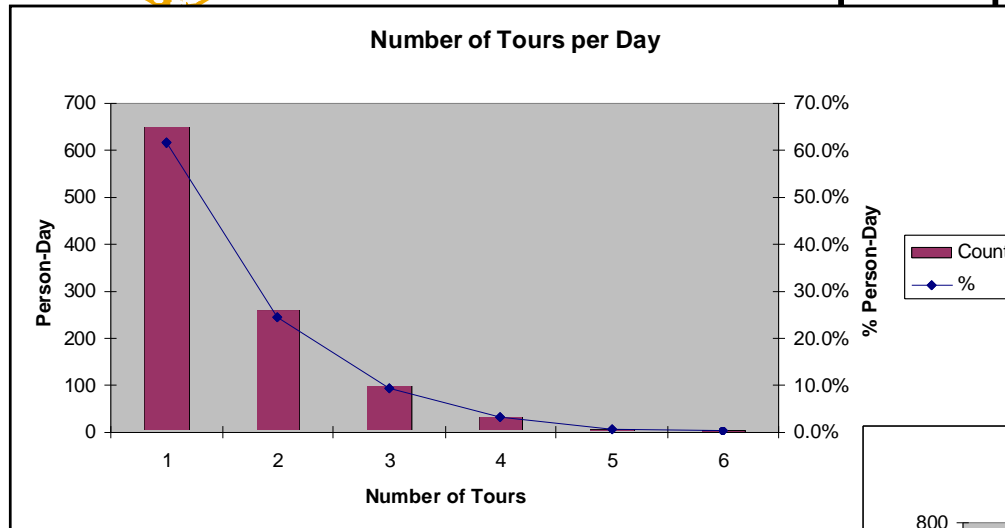
# Some Statistics

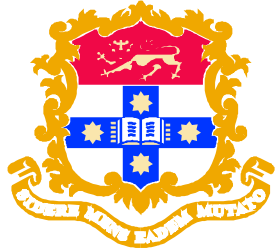


- Average tours per person-day: 1.57
- 61.7% person-days were one-tour days
- Tour duration (in minutes):  
mean=170.80, median=109.5
- 43.5% tours were two-trip tours
- Number of trips per tour:  
mean=3.13, median=3
- All 47 one-trip tours were Home-based Other tours

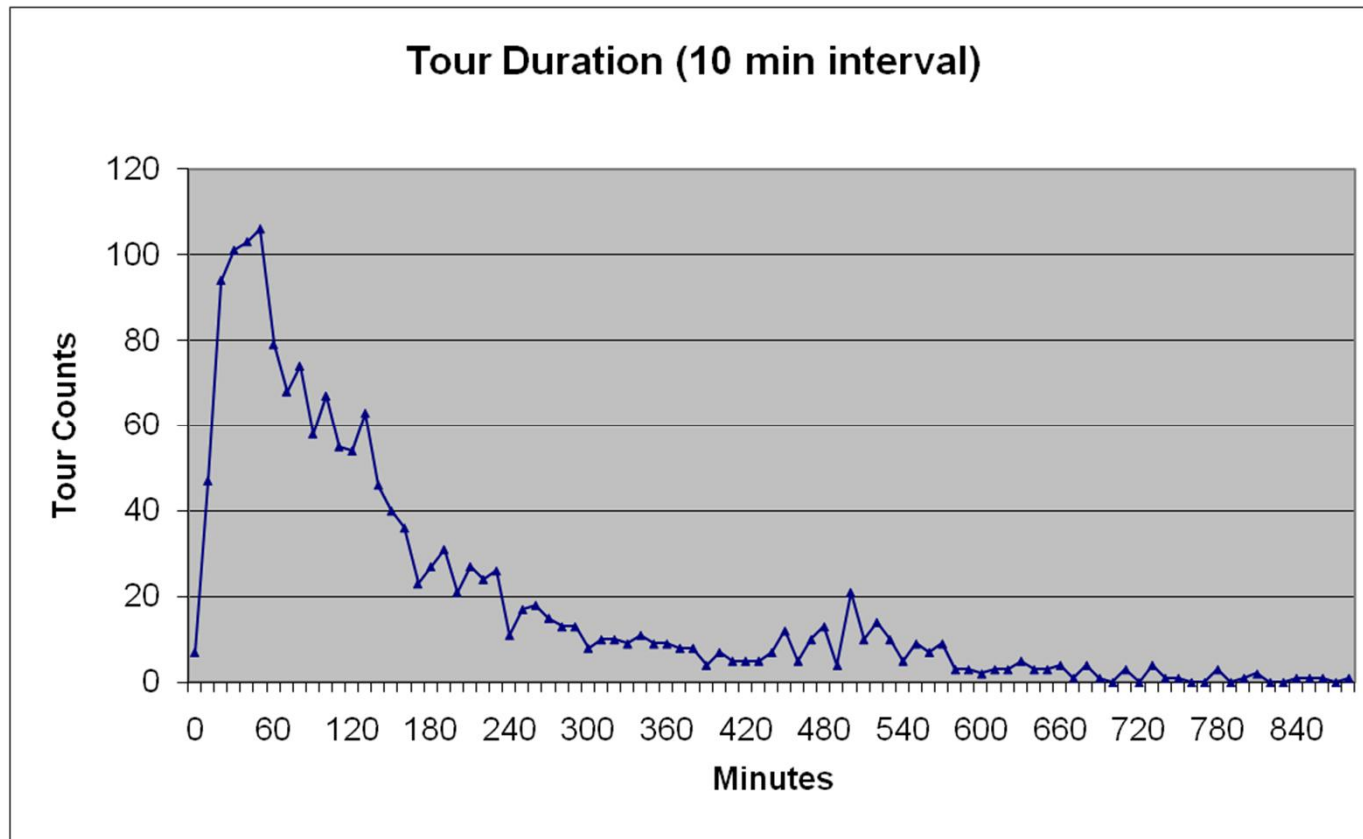


# Distribution of Tours and Trips per Day

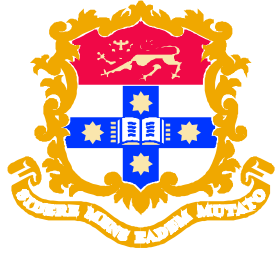




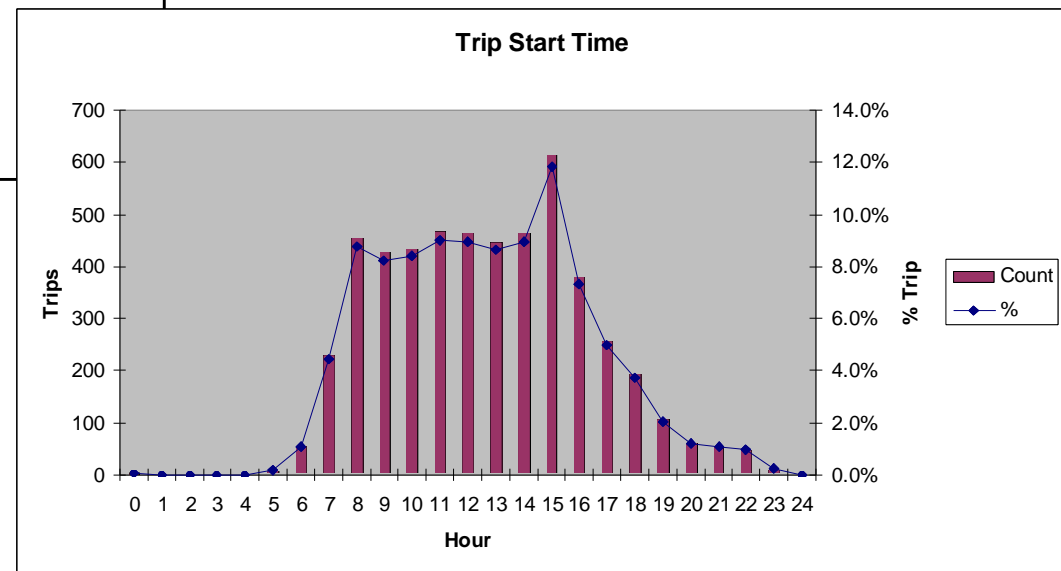
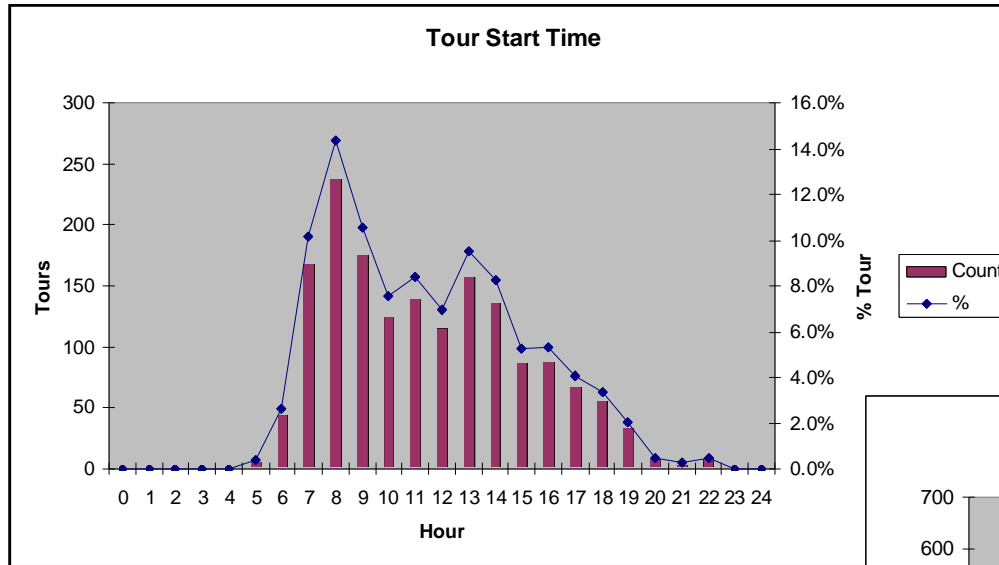
# Tour Duration Distribution

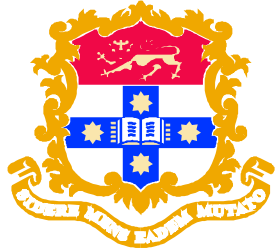




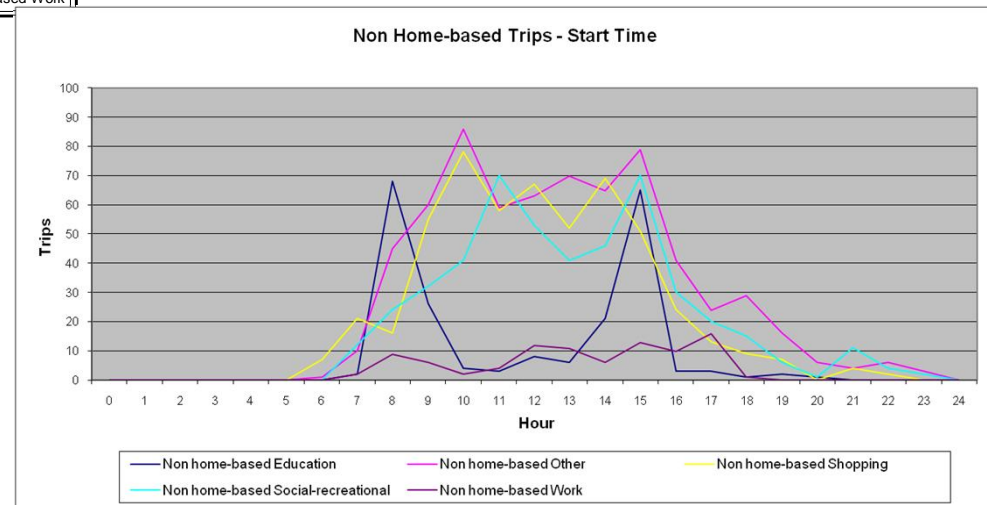
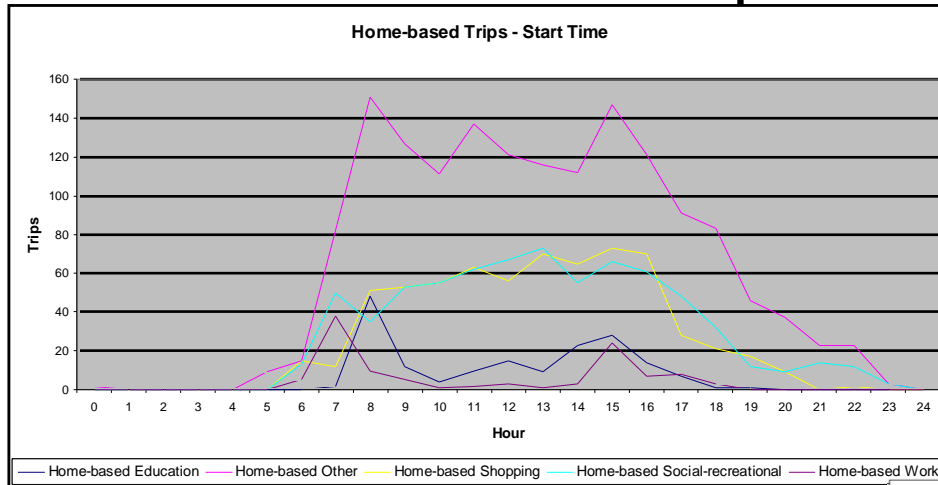


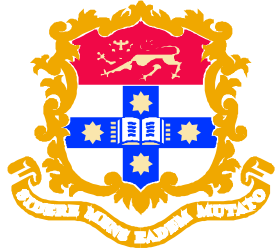
# Trip and Tour Start Times





# Start Times by Trip Purpose

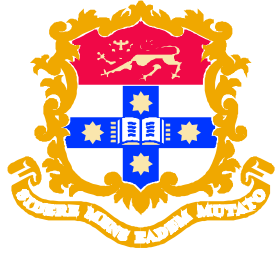




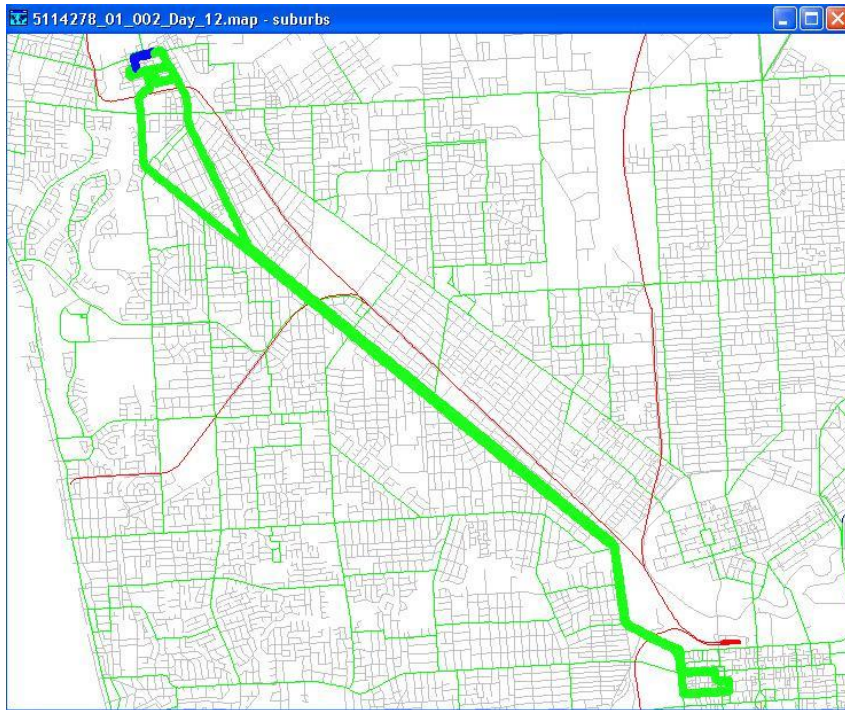
# Examples of Tours



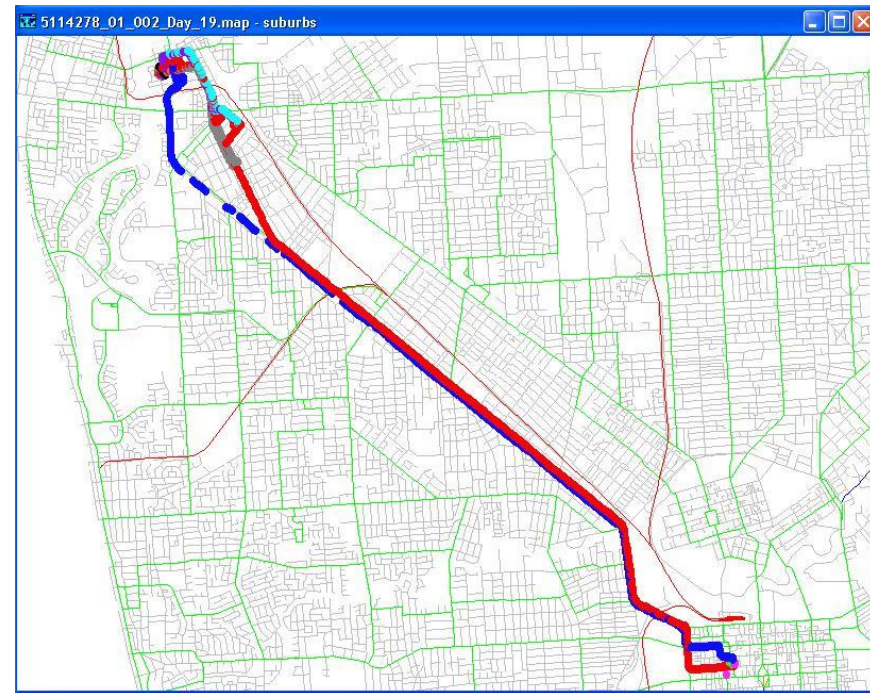
- Both simple (out and back) and complex (multi-stop) tours are readily identifiable from the GPS traces
- Precise travel times and activity durations can also be obtained
- However, looking for repetition revealed relatively few repetitions – what does this say about habit?



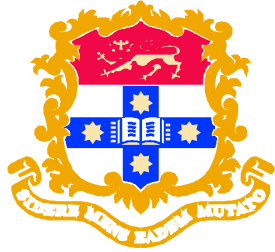
# Example of GPS Tours



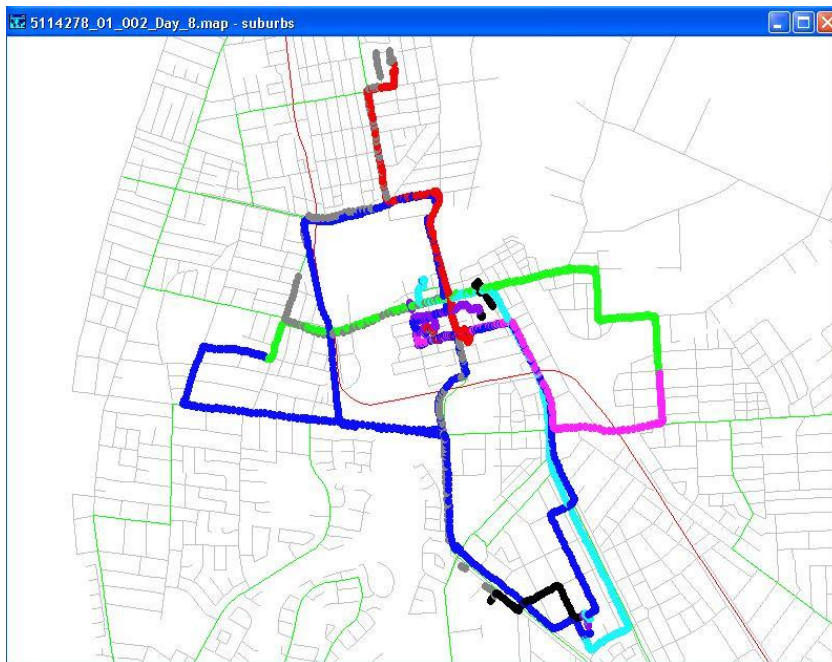
Day 12



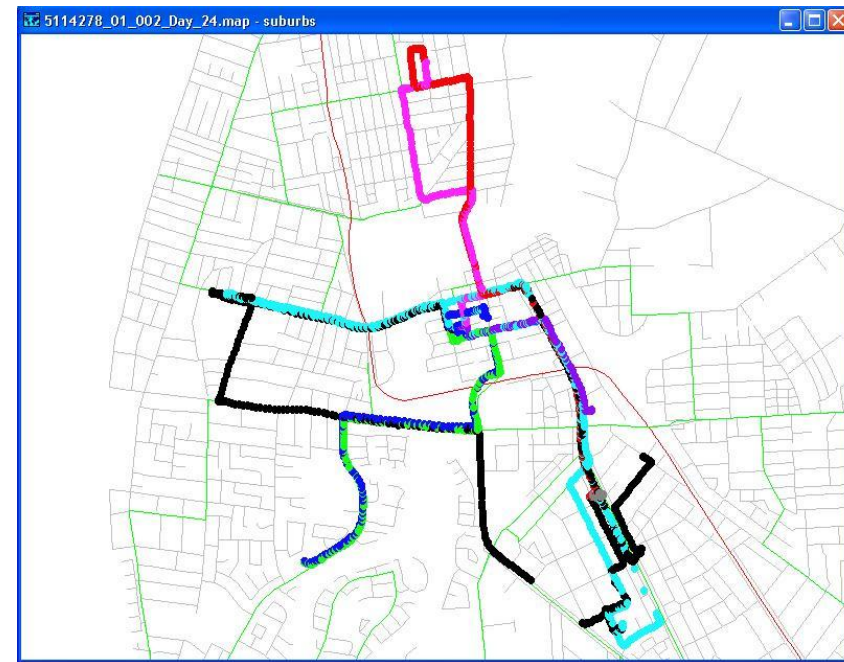
Day 19



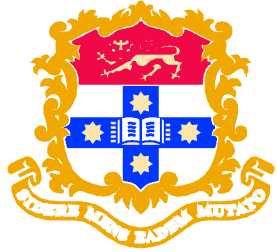
# Example of GPS Tours



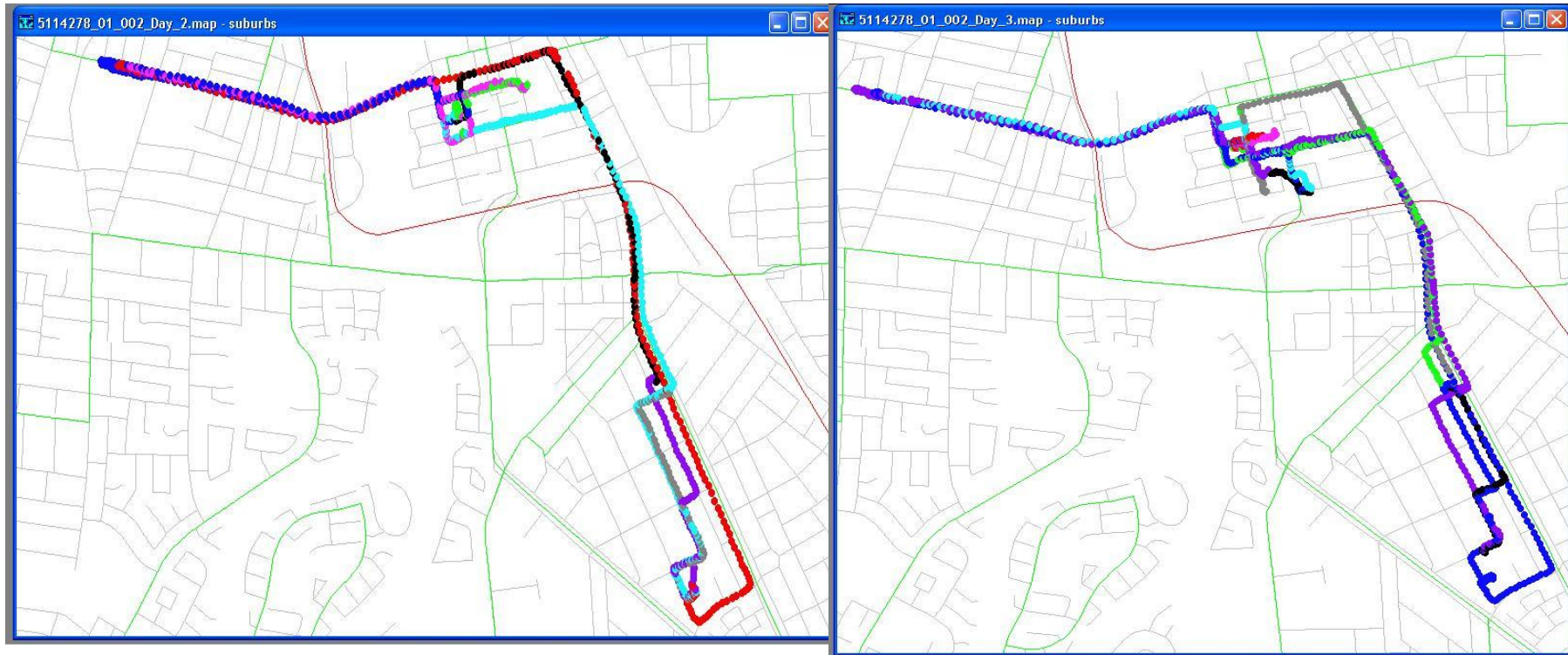
Day 8



Day 24

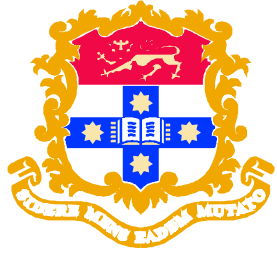


# Example of GPS Tours

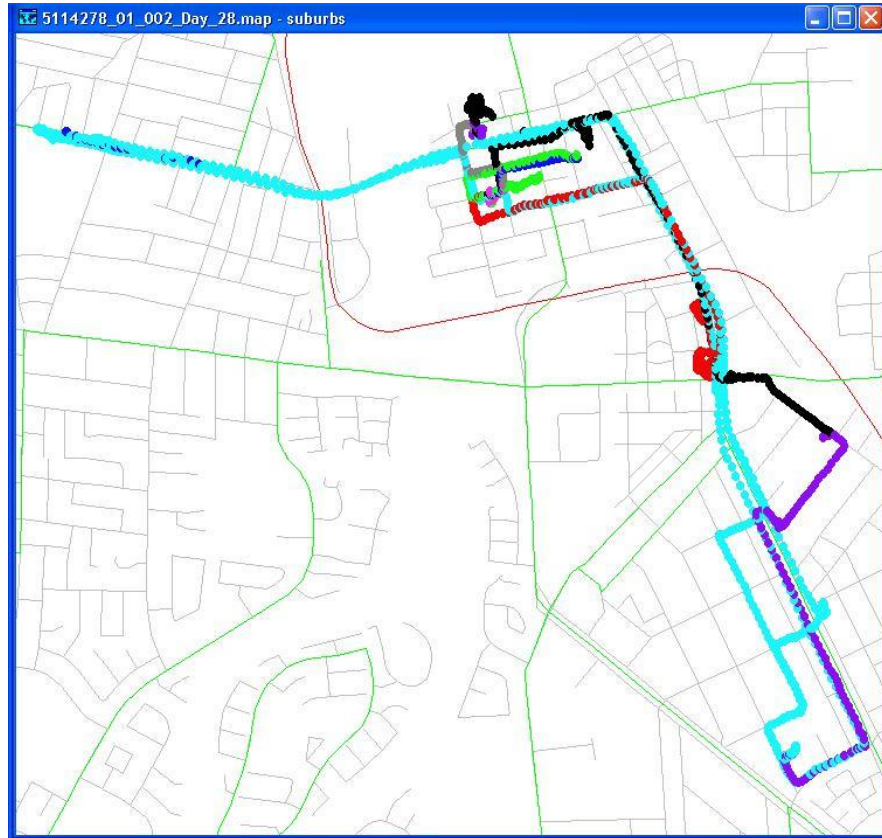


Day 2

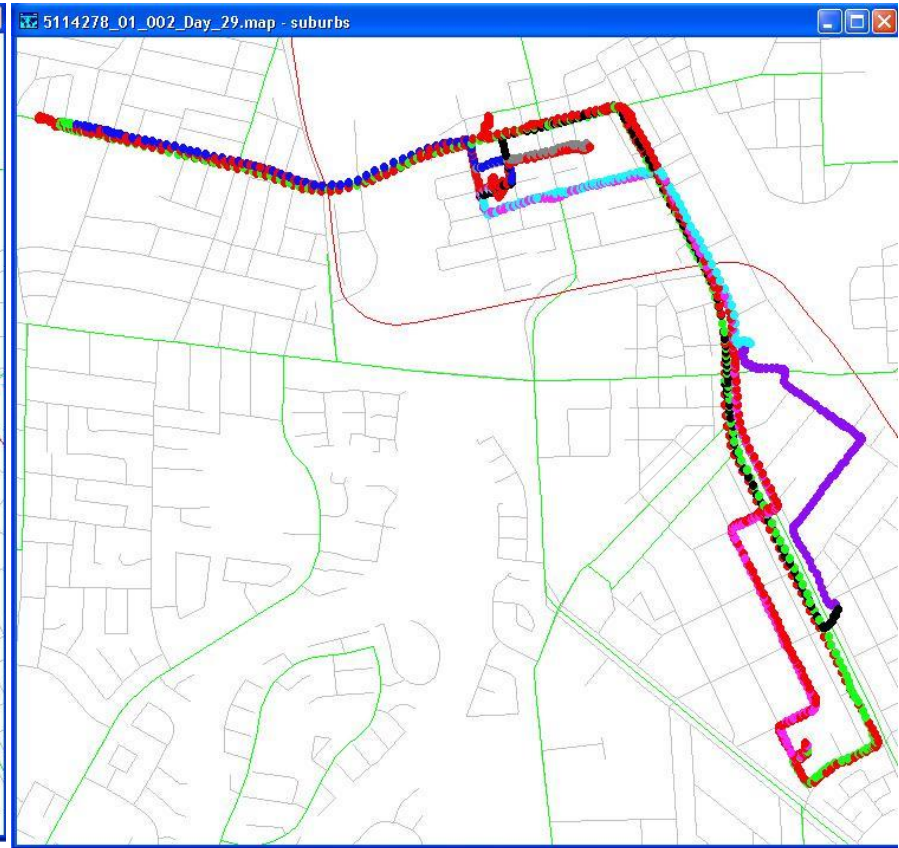
Day 3



# Example of GPS Tours



Day 28

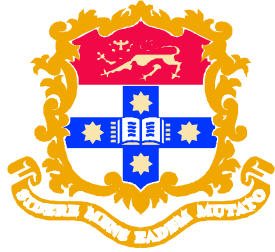


Day 29

June 29-30, 2009

The Joy of the Journey: Celebrating the  
Life and Work of Ryuichi Kitamura

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# Conclusions



- There is a wealth of good information in the GPS data for building improved tour choice models
- For one of the first times probabilities can be observed
- Although mode and purpose cannot be observed they can be deduced
- We can look at habituation and repetitive patterns
- The research directions pursued by Ryuichi can be extended with such data