Application Form of EASTS IRG (International Research Group)

IRG-14-2009

Date of Submission: 2009/ 09/ 15

1. Name of IRG: Platform for Transport and Environmental Information (PTEI).

2. List of research members (Please add if you need)

1) a) Name: Branko Stazic
b) EASTS Regular Member ID number: au-95-07-0027
c) Affiliation: National Committee on Transport
d) Country/Region & Address: Australia/South Australia/City East Campus, North Tce, 5000 Adelaide

2) a) Name: Dr Nikolaos Vogiatzis
b) EASTS Regular Member ID number: au-95-09-0006
c) Affiliation: National Committee on Transport
d) Country/Region & Address: Australia/South Australia/City East Campus, North Tce, 5000 Adelaide
e) E-mail: nikolaos.vogiatzis@unisa.edu.au

3) a) Name: Dr Wen Long Yue
b) EASTS Regular Member ID number: au-95-09-0004
c) Affiliation: National Committee on Transport
d) Country/Region & Address: Australia/South Australia/City East Campus, North Tce, 5000 Adelaide

4) a) Name: Dr Sadasivam Karuppannan
b) EASTS Regular Member ID number:
c) Affiliation: National Committee on Transport
d) Country/Region & Address: Australia/South Australia/City East Campus, North Tce, 5000 Adelaide

5) a) Name: Dr Sekhar Somenahalli
b) EASTS Regular Member ID number: au-95-09-0005
c) Affiliation: National Committee on Transport
d) Country/Region & Address: Australia/South Australia/City East Campus, North Tce, 5000 Adelaide

6) a) Name: Professor Huang Huixian
b) EASTS Regular Member ID number:
c) Affiliation: Society of Transportation and Logistics Studies, CCTA
d) Country/Region: China/ Xiangtan University, Xiangtan, Hunan

7) a) Name: Professor Yang Huixian
b) EASTS Regular Member ID number:
c) Affiliation: Society of Transportation and Logistics Studies, CCTA
d) Country/Region: China/ Xiangtan University, Xiangtan, Hunan

3. Purpose and Mission of IRG:

Adaptive computer controlled traffic management systems are used to monitor and control traffic signals all around the world. The Sydney Coordinated Adaptive Traffic System (SCATS) was developed in 1970s and has demonstrated great benefits for isolated and area linked signalised intersection controls[1, 2]. These systems also collect and store extremely large amounts of data that can be useful input to the transportation planning and management process [3-7]. The development of a traffic data abstraction layer would enable effective and efficient data handling and represent an

important tool that would help transportation professionals in making better traffic management and planning decisions.

At the core of this IRG, is the use of traffic signaling data collected by implementations of SCATS, one of the world's leading intersection traffic management systems, which is used in many countries in East Asia, including China, Australia, Hong Kong, Indonesia, Malaysia, Singapore, New Zealand and Philippines.

SCATS produces numerous 'log' files which are typically read using the SCATS *Traffic Reporter* application provided by the developers[7]. This tool allows traffic signalling engineers and practitioners an "off-line" tool for quick and simple access to the rich data stored within, however it does have some limitations including the inability to easily produce time series reports of intersection and network performance. The developers of SCATS have supported researchers from the Institute for Sustainable Systems Technologies – Transport Systems (ISST-TS) at the University of South Australia to develop a long-range signalling system analysis tool by providing the necessary log file protocols that allow for the independent processing of the from a binary computer efficient format into a human readable format capable of being loaded into a database management system.

Since 2003, researchers from ISST-TS have developed the **Nexus** database which is capable of querying SCATS human readable data and providing answers to complex queries[6]; which would not be possible using Traffic Reporter such as:

- Time Series analysis of
    - Individual intersections, by approach, by lane, by season (for example, every Wednesday between 0700 ~ 0900 over any given number of years for any given list of intersections within the entire network), vehicle volumes and direction.
    - Intersection performance, including how many and for how long have individual detectors failed
- Correlation of intersection *types* and the development of scaling factors for the normalisation of intersection key performance indicators.
- The calculation of directional and intersection Average Annual Daily Traffic, as these are crucial to planning and road investment decisions
- Spatial-Temporal/GIS analysis of intersections demonstrating strategic network usage and points of network vulnerability
- And more…

Much work has already been performed using the data, however, data cleansing is a long manual process at this time.

This project aims to develop an abstraction layer which will allow for the development of algorithms for removing errant data (such as can be found when detectors produce aberrant counts

or during times of detector alarm when no data is collected), standardising the output so as to allow 'like'-to-'like' intersection analysis thus providing the mechanism by which intersections can be classified automatically by geometry, land-use, population density, vehicle volume density, seasonal intersection utilisation, public transport corridors, vehicle classification, and other relevant data. This then will allow for high accuracy associated with any necessary data imputation in the development of the abstraction layer. In order to ensure the highest accuracy, other vehicle counting/classification data sources will be employed, including manual (turning/non-turning) counts, video detection, pneumatic tube counters, to name a few. This will provide an *overlapped* data space vastly reducing overall errors in the abstract data layer.

As a result, numerous *template* type reports will be created which provide relevant measures of intersection performance that can be produced automatically on an on-going basis with little human interaction other than to verify the accuracy of the information presented. These reports will be flexible insofar as they will allow traffic practitioners the ability to request generalised reports for any given intersection or groups of intersections over any given time period.

It is expected that the research relating to SCATS operations and data correlations will provide a solid base to perform further research for the benefit of the wider community.

References

1. Tyco Integrated Systems Ltd and Roads and Traffic Authority New South Wales. *Traffic Management - SCATS*. 2006 [cited 2009 March]; Available from: http://www.traffic-tech.com/pdf/scatsbrochure.pdf.
2. Sims, A.G. and K.W. Dobinson, *The Sydney coordinated adaptive traffic (SCAT) system philosophy and benefits*. Vehicular Technology, IEEE Transactions on, 1980. **29**(2): p. 130-137.
3. Stazic, B. and N. Vogiatzis, *Algorithm for Calculating Average Vehicle Counts by Imputing Intersection Data from SCATS Installations*. 2009, Institute for Sustainable Systems and Technologies - Transport Systems: Adelaide, Australia.
4. Fehlmann, S., et al. *Nexus: Developing a Schema to Contain Disparate Traffic Data Types for Parallel Distributed Processing*. in *Papers of the 29th Australasian Transportation Research Forum*. 2006. Gold Coast, Australia.
5. Ikeda, H., et al. *Three Layer Object Model for Integrated Transportation System*. in *1st International Workshop on Object Systems and Systems Architecture*. 2004. Victor Habor, Australia: The Jacaranda Group at the University of Adelaide.
6. Vogiatzis, N., *NEXUS: Urban Traffic Control (UTC) historical database reporting tool*, in *Nexus I ~ Nexus III*. 2004 - 2009, Institute for Sustainable Systems and Technologies - Transport Systems: Adelaide.
7. Vogiatzis, N., *On Organic Transportation and the Next Generation Urban Traffic Management Systems*, in *Transport Systems Centre*. 2008, University of South Australia: Adelaide. p. 448.

4. Future research plan including time frame:

1. Obtain SCTAS data from Department of Transport in China (Already have data from Adelaide, Australia).

2. Develop abstracted data layer schema/e.
3. Cleanse data and prepare database management system (DBMS) resources.
4. Collect data from other sources necessary for data evaluation.
5. Evaluate and impute missing data.
6. Insert cleansed abstracted data into DBMS.
7. Produce automatic traffic report templates.
8. Present findings and lessons learnt at the EASTS Conference.