

Woodgate Wisdom

A key skill in your professional lives will be your communication. Distilling the wisdom of Socrates, the father of philosophy, in my own way, I've been guided by three principles, 1) think things right through before you communicate, even if it's just one sentence, 2) always use words whose meaning is precise, and 3) use the fewest number of words possible to convey the maximum meaning. And the beauty of this approach is that the more you practice it in your everyday lives the better you become.

Best wishes,
Peter

The Collier Corner

When I was a PhD student – and yes, that was a year or two ago – the thorny question of intellectual property ownership was rarely raised. Now, barely a day goes by for me without "IP" being mentioned at some point. Such conversations generally cause my eyes to glaze over and my brow to furrow because IP is a foreign language as far as I'm concerned. But in reality, it's a good thing that we're now more conscious of the potential value and impact of our research.

What you do as a CRCSI PhD student in creating IP is inherently valuable and that value should be explored and recognised. While not every student will lodge a patent, start a new business, cure cancer, or become the next Mark Zuckerberg, it's worth asking yourself the question "what is the value of my research?"

Students often need help when it comes to understanding, defining and valuing IP. It is for this reason that we are planning a half day IP workshop as part of the next CRCSI conference in November. Stay tuned for details from Nathan, and plan to be part of an interesting, informative and interactive event.



Nic chairing a session at FIG2014 in Kuala Lumpur, Malaysia

Get Amongst the Networking Action

Nic Donnelly, P1.02

I had the opportunity in June to attend the International Federation of Surveyors (FIG) Congress in Kuala Lumpur. As with many conferences, I found the most valuable aspect of the event were the networking opportunities with other people from around the world. This is something you don't get by reading academic papers, or watching a recording of a presentation. It is also, for many of us, one of the most difficult things about attending conferences – particularly as a student. But the rewards can be great.

For example, at a conference in 2010, I deliberately chose to sit with people at the conference whom I did not know particularly well, rather than sitting with the rest of my colleagues. It turned out the person I sat beside was the Director of the International GNSS Service Central Bureau, based at NASA's Jet Propulsion Laboratory (JPL). She was interested in my research and from that chance conversation, I was offered a 3 month internship at JPL, which I undertook in 2012. That internship gave me the opportunity meet some of the top GNSS and radar scientists in the world, which has proved very valuable in my subsequent research.

Another way to build your network is to get involved in the working groups that many international spatial groups operate. At the FIG conference last month, I was appointed Chair of the Reference Frames in Practice working group. This is a group I have been involved with for several years. When first

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approached for this role, I considered turning it down. After all, the other members of the working group are all far more experienced for such a role. However, this is a great opportunity to further build my spatial network, by working closely with a number of eminent geodesists and geodetic surveyors from all corners of the world. It will also help me with my research, enabling me to test ideas and discuss challenges with others who are passionate and knowledgeable about the subject. Finally, getting involved in a group like this enables me to hone some skills that academic study alone doesn't. I need to develop a work programme, organise and run meetings, plan events and edit publications. And while I'm fortunate to already have a job when I finish my research, these contacts would prove useful if I were still looking.

So next time you're at a conference or meeting, look for the opportunities to network. Often it will lead nowhere, but opportunities you may have never considered may present themselves.



Nic beside the Satellite Laser Ranger (SLR) during a visit to NASA's Goddard Space Flight Center.

My Research News, Issues & Outcomes

We asked 5 students from across the research program for their latest updates.

Health

Jannah Baker, P4.42

I have completed a systematic review paper of spatial studies examining spatial variation in type II diabetes mellitus (DM II), and another paper examining spatial variation in and geographic risk factors for DM II risk across Queensland local government areas.

I am now working on a hierarchical model examining both individual and geographic risk factors for hospitalisation with DM II complications in NSW North Coast hospitals. I hope to write both a spatial and a spatiotemporal paper from these analyses.

Further to this, I will be examining spatial and temporal trends in DM II prevalence across Queensland postcode areas.

Urban Planning

Cole Hendrigan, P4.51

The research into regional planning for automobile-dependent cities has uncovered several results. A brief of the results include:

- the expected reduction in tonnes of GHG emissions per person per year from transport and shared-wall living
- expected kilometres of walking with a concomitant decrease in health care cost and increase in economic productivity
- the right-sized public transport mode suited to the task of matching the expected population growth
- how to visualise the required density in the best transit-oriented places

Though the research reveals a suite of results based on different scenarios, the answer to these questions lay with potential future users of the outcomes. What is revealed is a method and a model to comprehend urban planning and design at the scale of a Transit-Oriented Region.

Positioning

Nuddin Tengku, P1.04

I have conducted an in-depth analysis on the characteristics on unmodelled GNSS errors. This is to be used as an independent parameter for receiver performance benchmarking.

Preliminary results on the utilisation of Bayesian Signal Processing techniques to quantify these parameters show very promising outcomes. Findings on the repeatable receiver tests and user needs analysis have been finalised and is expected to be published in the near future. I also plan to collaboratively work with Geoscience Australia on the Signal Record and Playback device tests later this year.

Spatial Marketplace

Jeremy Fa, P3.01

My research about federated models, framework datasets, supply chains and query-based spatial in Australia and New Zealand has developed a better understanding of background issues. Furthermore, there has been opportunities to meet up with business and industry partners.

The next step is to have a more focused approach regarding the PhD, thinking about the specific tools, infrastructures and language to be used on the semantic web towards federation.

Feature Extraction

Richard Palmer, P2.01

Recently, I have been working on developing a faster, more efficient Euclidean distance transform (DT) algorithm for my work on object recognition. A DT is a function that maps every background point in a binary image to its nearest foreground point.

DT algorithms are intrinsic in many areas of image processing and computer vision. Some tasks that incorporate DTs as part of their algorithms include watershed segmentation, morphological image filtering, extraction of object shapes and Delaunay triangulation. Because of the importance of DT algorithms, fast and efficient methods are important to avoid potential processing bottlenecks.

Only recently have fast and exact Euclidean DT algorithms been developed. Recent work in this development have focussed on a particular form of algorithm termed "independent scanning". This algorithmic framework is not only able to compute the exact Euclidean DT, but it is easily extensible to imagery of more than two dimensions, and to concurrent processing. In my recent work, I have developed several optimisations to this algorithm.

I have evaluated the new algorithm against seven of the most recent state-of-the-art algorithms. I have found that because of these optimisations, the new algorithm runs at least as fast as the recent state-of-the-art algorithm, and runs up to a third faster on several important classes of imagery.

This new algorithm will allow me to incorporate more complex and accurate processing in my object recognition processing framework while maintaining an efficient rate of processing.



R. Palmer. The input image to the left is first thresholded to produce the binary image in the middle, which is in turn processed by the Euclidean distance transform algorithm to produce the right image.

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Collaboration is Pivotal

Simon Fuller, Think Spatial

As a student within the CRCSI you will be working on a project that has industry partners. These partners have committed to providing you with support and they are very interested in collaborating with you. This places you in a unique position as a researcher.

Firstly, you can be certain in the knowledge that your research will be making a valuable contribution to the spatial information industry - the organisations that make up your "support crew" would not have committed their time, energy, and money to something they did not consider worth investigating!

Secondly, your industry partners (big and small) have a wealth of knowledge in their respective fields, are experienced in solving problems, know how to work efficiently, and can provide you with access to resources that are beyond the average research student's grasp. Take advantage of these benefits, your research will be greatly enhanced as a result.

Finally, with an eye to the future, collaborating with your industry partners provides you with an excellent opportunity to build links that will last throughout your career. There is no better way to impress a potential employer than to demonstrate your credentials whilst working towards a common goal.

Five Collaboration Tips:

1. Make the first move

Find out who your industry partners are and arrange to visit, or call them. Avoid simply emailing and hoping they respond.

2. Listen closely to what your partners have to say

They probably know a bit about the problem and have tried to solve it!

3. Communicate

Explain what you think the problem is, see if they agree, refine your understanding of the problem, keep your partners informed of what/how/when you are doing so they can provide with feedback, ideas, resources, equipment, etc.



Figure A - Simulated forest stand

Research on the Road

Phil Wilkes and Will Woodgate, P2.07

The second and third week of June saw the P2.07 team travel to Queensland and NSW to give roadshow presentations to project partners and interested parties alike. As 2.07 is wrapping up later this year, it was a great opportunity to present some of the main research outcomes and gain insightful feedback and input from end users into the final direction of our work.

Phil discussed his research on the use of LiDAR and Landsat for the assessment of forest structure at the regional scale, in particular attribution of canopy height and complexity. He also unveiled ForestLAS, an open-source toolkit for processing LiDAR data to derive forest structural metrics (Figure C). The tools can also be used to analyse .las files in a Python environment.

4. Make use of your partners resources

Industry partners contribute cash and in-kind to your project. If you need help with software programming, data, equipment, analysis, etc. then perhaps there is an industry partner who can provide it. An important part of collaboration is knowing what you are not good at!

5. Be persistent

Some links/relationships take time to develop, others may not have been apparent at the start of the project. Notice changes in your project and within the spatial industry.



Figure B - Simulated Box Ironbark forest upward hemispherical view

Will presented findings relating to best practice guidelines to collect forest cover and density information in the field. As well as showing a modelling framework to simulate remote sensing instruments and test algorithms in a virtually reconstructed forest to derive key forest structure metrics (Figures A & B).

The roadshow was a great opportunity to increase third party engagement and form new ties, something that would be quite difficult to achieve without the context of a project with partner engagement. The work was well received by all. This has no doubt increased exposure of the great work done in the project, and was very fulfilling to see individuals and organisations interested in applying tools and findings from our work.

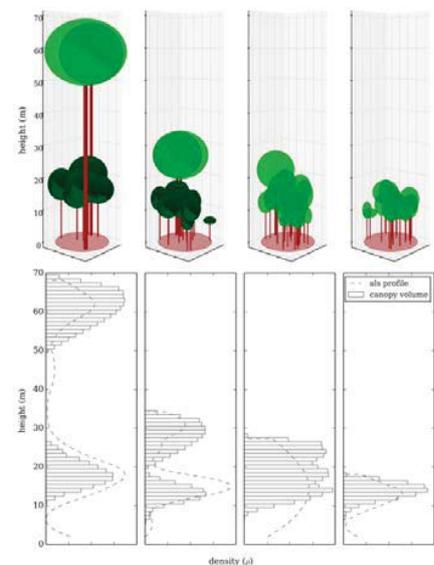


Figure C - Validating canopy height profiles by comparing ALS with field derived crown volumes

Let's Meet Tristan

T. Reed, P3.01

In my spare time, I like to travel, enjoy fine food, exercise, play music or work on my car - amongst other things!

Although not strictly a book, being a fan of Australian politics and non-fiction works I do enjoy reading the Quarterly Essay.

The last movie I watched, I believe was the new X-Men movie with some of my fellow students. Quite the spectacle on the big screen!

The last place I travelled to was Christchurch to meet the P3 team at UC. Sadly, I underestimated how cold it would be in New Zealand and froze the whole trip! Next year I am hoping to head off to Vancouver. Should be a fun time enjoying the snow and the sights of Canada!

In Perth it's hard to beat the coffee and breakfast at Ingredient Tree in Wembley. For a beach I personally go for Brighton (which is 500m south of Scarborough) - same quality waves but a lot less people! Keep in mind for the CRCSI conference.



Tristan Reed bowling a spare backwards, as you do.

CRCSI Alumni

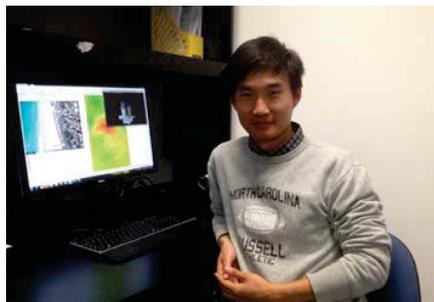
Where Is... Jessica Roberts?

I was on the Biomass Business project at the CRCSI. I am now currently working as a full time precision agriculture scientist at Lincoln Agritech in New Zealand. This is an R&D science company owned by Lincoln University but managed independently.

Currently my major project aims to reduce Nitrogen fertiliser inputs in intensively grazed pasture systems (Dairy). We are using several commercial sensors as well as developing our own for detecting particular pasture features to inform of the need for fertiliser at a sub-paddock scale. David Lamb and Mark Trotter from UNE (also part of the CRCSI) are collaborators on this project.

Where Is... Xin Liu?

Xin Liu is currently working at the Australasian Joint Research Centre for Building Information Modelling (BIM), Curtin University as a research fellow. The major duty for him in the BIM centre is to undertake the project of "Development of the Geospatial Building Information Model (GBIM) System to Improve the Infrastructure Construction Process and Supply Chain Management". This project aims to improve the productivity of the construction management in Australia.



Xin Liu in work mode. Tidy desk!

Also, Xin is partially involved in the project Echo, which was initiated by Woodside Energy Ltd. This project aims to reduce capital and operational costs of future LNG megaprojects through intelligent execution and reduce project execution risk through real-time technology-based progress monitoring, quantity surveying and smarter financial management. Xin's spatial science background can provide essential supports to the success of the project.

Furthermore, Curtin University is currently developing international collaboration opportunities with Ocean University of China, which was a part of collaborative research programs funded by Australian and Chinese government. As Xin's PhD study is to determine high water mark position along the coastline, he is the key person to build this relationship, develop research funding program and supervise exchanged postgraduate students.

Recent Publication

Project 2.02

Ghanbari Parmehr, E., Fraser, C.S., Zhang, C., Leach, J. An effective histogram binning for mutual information based registration of optical imagery and 3D LiDAR data. IEEE International Conference on Image Processing (ICIP) Sept 15-18 2013 Melbourne

Education Update

N Quadros, Education Mgr.

The plans for the CRCSI Conference are in full swing. The student day program is coming along. It is going to have an intellectual property (IP) focus. There will also be a lot of chances for discussion amongst students. The 3 Minute Thesis will be integrated into the main part of the conference, so get ready to summarise your research! Cheers... Nathan

Utilisation Focus

P. Wilkes, P2.07

RMIT P2.07 has developed an open-source toolkit called ForestLAS which makes use of LiDAR data to attribute forest canopy structure. Despite ForestLAS still being in production, the team have a beta version available for people who are interested in testing and utilising the tool.

For more info. <http://bit.ly/1rwgcWf>