Department of Spatial Sciences
2012 Undergraduate / Honours / Postgraduate Project List

The following projects are available for students enrolled in:

Spatial Sciences Project 494
Spatial Sciences Project 594
Spatial Sciences Project 692

Projects have been organised according to disciplines (surveying, photogrammery, mine surveying, GIS, mapping) to assist students. However, as many projects overlap into more than one discipline area, students are encouraged to **check the complete project listing.** You are free to select a project from ANY topic area.

* If students wish to suggest their own projects in any area of the spatial sciences or choose modified versions of the projects listed, please contact the relevant member of staff.

Surveying / Mine Surveying / Photogrammetry

ACSIS LTD – IAN MARLER AWARD
INCREASING AWARENESS OF RISK MANAGEMENT IN THE SURVEYING INDUSTRY

Supervisor: Tony Snow: 207:209, tel. 9266 4127 t.snow@curtin.edu.au

Project Description:
ACSIS Ltd perceives a need to increase awareness at student level, of risk management in daily practice of the surveying profession. The management of risk involves identifying potential areas of risk and then adopting appropriate techniques/measures to minimise that risk. Students are asked to submit a project of between 3000 and 5000 words in a response to the question "What areas in a surveying task or contract will generate the most likelihood of errors and how are they best prevented." The award will be judged on the identification of risk and the methods used in the reduction of professional indemnity claims from negligence, trade practices legislation, breach of contract, poor business and field practices. The winner will be awarded a prize of $5,000. Full details concerning the award can be viewed in the news section of the Spatial Sciences' website.

ADVANCED RECEIVER AUTONOMOUS INTEGRITY MONITORING (ARAIM) OVER AUSTRALIA USING ALL GNSS

Level: M.Sc. project or Honours
Supervisor: Dr. Ahmed el-Mowafy, 207:208, Phone: 9266 3403, a.el-mowafy@curtin.edu.au

Project Description:
The use of GNSS for aircraft navigation is expanding. However the use of the system as a supplementary/primary means of navigation requires ensuring high

level of integrity. In this project, the most recent Advanced Receiver Autonomous Integrity Monitoring (ARAIM) methods will be applied for integrity checking using all available GNSS, including GPS, Galileo, QZSS and GLONASS. A long period of data from continuously operating GNSS stations close to major airports across Australia will be used in this study. The impact of adding Galileo and QZSS to GPS will be analysed. Integrity monitoring plots, statistics and information at the test locations will be generated and checked against requirements of safe aviation. ARAIM Software is available.

ANALYSIS OF GRACE SOLUTIONS USING LOCALIZED BASIS FUNCTIONS AND SURFACE LAYER POTENTIAL OVER AUSTRALIA

Supervisor: Dr.-Ing. Joseph Awange: 207:228, tel. 9266 7600, J.Awange@curtin.edu.au

Project Description:
Monthly solutions of GRACE satellites have not been able to adequately show the variation in Australia's stored water potential due to weaker hydrological signals fuelled by prevalent episodes of drought on one hand and the seepage of oceanic signals on the other hand. This project seeks to exploit the capability of localized basis function and surface layer potential to offer an alternate solution.

ANALYSIS OF HIGH SPATIAL RESOLUTION MASCON OVER AUSTRALIA

Supervisor: Dr.-Ing. Joseph Awange: 207:228, tel. 9266 7600, J.Awange@curtin.edu.au

Project Description:
Ten days Mascon (mass concentration) solutions of GRACE satellites over Australia will be released at 2^o x 2^o. This project will process these data to adequately show the variation in Australia's stored water potential. It is hoped that the new solutions will address weaker hydrological signals in Australia fuelled by prevalent episodes of drought on one hand and the seepage of oceanic signals on the other hand.

ANALYSIS OF THE PERFORMANCE OF GRAS (GNSS Receiver for Atmospheric Sounding) OVER AUSTRALIA

Supervisor: Dr.-Ing. Joseph Awange: 207:228, tel. 9266 7600, J.Awange@curtin.edu.au

Project Description:
GRAS (GNSS Receiver for Atmospheric Sounding) was installed onboard the European owned Meteorological Satellite (MetOp) satellite. This project will seek to analyse the performance of this near polar orbiting satellite with regard to remote sensing of Australia's atmosphere. The project will compare the tropopause heights and temperature to those of COSMIC, CHAMP and GRACE.

ANALYSIS OF THE PERFORMANCE OF FOUR GNSS REMOTE SENSING MISSIONS OVER AUSTRALIA

Supervisor: Dr.-Ing. Joseph Awange: 207:228, tel. 9266 7600, J.Awange@curtin.edu.au

Project Description:
The project will extend on the work done at Honours by Khandu (2010) and compare the performance of the four GNSS remote sensing missions over Australia. These are COSMIC, CHAMP, GRACE and GRAS (GNSS Receiver for

Atmospheric Sounding). The project will analyse the *number of occultations*, *temperature* and *pressure profiles*, *tropopause heights* and *tropopause temperature* and compare the results to those of radiosonde. The outcome of the result will be relevant for detailing the future use of these data for environmental monitoring of weather, climate and atmospheric changes over Australia.
Khandu et al (2010) GNSS remote sensing of Australian tropopause. *Climatic Change*, in press.

ASSESSING THE SUITABILITY OF THE MOBILEMAPPER 100 FOR USE IN ENVIRONMENTAL MONITORING TASKS REQUIRING DETECTION OF SPATIAL CHANGES.

Supervisor: Dr.-Ing. Joseph Awange: 207:228, tel. 9266 7600, J.Awange@curtin.edu.au

Project Description:
The Ashtech's MobileMapper 100 is designed to offer meter level stand alone accuracy for application where other handheld receivers deliver up to 10 m level accuracy (at 95% confidence level). With the incorporation of satellite-based augmentation service (SBAS), it offers sub-meter level accuracy and decimeter accuracy in Flying RTK mode. For short baselines, the receiver is said to be able to produce centimeter-level accuracy. This project will continue the work of Schloderer et al. (2010) and assess the suitability of this receiver for measuring spatial changes (perimeter and area) of water bodies, e.g., Jack Finnery Lake.

Reference: Schloderer, G., Bingham, M., Awange, J.L., and Fleming, K.M., 2010. Application of GNSS-RTK derived topographical maps for rapid environmental monitoring: A case study of Jack Finnery Lake (Perth, Australia). Environmental Monitoring and Assessment, DOI 10.1007/s10661-010-1778-8.

ASSESSING THE POTENTIAL OF FORWARD GRAVITY MODELLING TO STUDY THE EARTH'S INTERIOR

Supervisor: Michael Kuhn: 207:225, tel. 9266 7603, M.Kuhn@curtin.edu.au

Project Description:
Currently, there is some debate in geophysics and geology on the structure of the Earth's interior with special focus on the Earth's mantle, core-mantle boundary and so called super plumes within the mantle. Various models have been proposed that largely differ from each other. This study should assess the potential of forward gravity modelling in the selection of the most appropriate geophysical/geological model. For this, the corresponding mass distributions of available models, existing hypothesis and simulated mass distributions should be forward modelled and their gravity signal compared to that of the observed gravity field at the Earth's surface (e.g. given by an Earth Gravity Model). Furthermore, the project should apply simple gravimetric inversion techniques in order to study possible mass distributions at the core-mantle boundary. This will be a challenging project looking into very interesting aspects of Earth studies.
Resources: FORTRAN77 software for gravity forward modelling (Newton integration) in space and frequency domain (by the use of spherical harmonics), various geophysical models of the Earth's topography, bathymetry, crust and mantle.

AUSTRALIA's GRAVITY WAVES ACTIVITIES FROM COSMIC GNSS REMOTE SENSING

Supervisor: Dr.-Ing. Joseph Awange: 207:228, tel. 9266 7600, J.Awange@curtin.edu.au

Project Description:

The air in the atmosphere has a straight or wave motion, which can either take on the *horizontal* or *vertical* pattern. A gravity wave is a *vertical wave*. The word gravity here is used to depict the fact that all air motions are influenced by gravity. Gravity waves (GWs) play an important role for the general atmospheric circulation due to the related transport of energy and momentum between different regions of the atmosphere. Since GPS radio occultation (RO) technique is sensitive to GWs, this project will study Australia's gravity waves from GNSS COSMIC RO satellites. This information will be relevant for weather and climatic studies.

CALIBRATION OF TERRESTRIAL LASER SCANNERS

Supervisor: Tony Snow: 207:209, tel. 9266 4127

t.snow@curtin.edu.au

Project Description:

As with all survey instruments, Terrestrial laser scanners (TLS) suffer from errors, either gross, random or systematic. In most cases, the systematic errors follow those observed in similar instruments such as Total Stations, and can be modelled to remove their effect. Such errors include range offset and scale errors, collimation and horizontal axis errors, and vertical circle index error. The ultimate goal of the project is to develop a calibration procedure based on survey targets, planar surfaces or individual points. The project will focus on one or more of the following steps:

- Development of a test site for data acquisition.
- Automatic acquisition and processing of scan data. This can include resection of scanner to control, generating control scripts for the TLS, and identifying and measuring targets.
- Modelling of systematic errors using least squares in terms of:
    - Single setup, fixed network calibration
    - Multi setup, fixed or constrained calibration
    - Multi setup, self calibration

For those students that have access to Mobile Mapping Systems (MMS), the project can also be changed to focus on the calibration procedures and error modelling of Mobile systems.

References

- K.-H. Bae and D. D. Lichti (2007), "On-site self-calibration using planar targets for terrestrial laser scanners", *Proceedings of ISPRS workshop on laser scanning 2007, Espoo, Finland*
- K.-H. Bae and D. D. Lichti (2007), "Plane-based self-calibration procedure for terrestrial laser scanners", Proceedings of SSC2007: The national biennial conference of the Spatial Sciences Institutes (SSI), Hobart, Australia

- Reshetyuk, Y. 2009 *Self-calibration and direct georeferencing in terrestrial laser scanning*, PhD Thesis, Department of Transport and Economics, Division of Geodesy, Royal Institute of Technology (KTH)

COHERENCE ANALYSIS OF GLOBAL TIDE GAUGE RECORDS

Supervisor: Michael Kuhn: 207:225, tel. 9266 7603, M.Kuhn@curtin.edu.au

Project Description:
Traditionally, sea level is monitored through tide gauge observations. Sea level variations are influenced by both tidal and non-tidal signals, where the latter are often an indication of regional or global environmental changes. This project will analyse globally distributed long-term tide gauge records with specific focus on coherence between the tide gauge records of neighbouring stations and/or between different regions.

COMPARISON OF AUSTRALIAN GRAVITY OBSERVATIONS TO THE EGM2008 GLOBAL GRAVITY MODEL

Supervisor: Dr Sten Claessens, 207:333, tel. 9266 3505, s.claessens@curtin.edu.au

Project Description:
The current Australian gravity database contains more than 1,300,000 gravity observations, which have previously been compared to gravity observations generated from the EGM2008 global gravity model. In this project, the differences between the observations and EGM2008 will be analysed in detail. The correlation of the differences with topography and geological features will be of particular interest.

CONSTRUCTION OF A DIGITAL DENSITY MODEL OF AUSTRALIA

Supervisor: Dr Jon Kirby: 207:207, tel. 9266 7701, j.kirby@curtin.edu.au

Project Description:
Analogous to a digital elevation model, a digital density model contains surface and near-surface rock density values on a regular grid covering the continent, with an estimated resolution of 12.5 km. Derived primarily from geological maps (but also well-log and seismic data if time permits), the model has its greatest application in the fields of geophysical exploration and gravimetric geoid determination, through improvement of computed Bouguer anomalies and terrain corrections. The project involves digitisation and computer work.

DEFORMATION MONITORING OF LARGE STRUCTURES

Level: Undergraduate
Supervisor: Dr. Ahmed el-Mowafy, 207:208, Phone: 9266 3403, a.el-mowafy@curtin.edu.au

Project Description:
In this project, possible temporal deformations of the new Engineering building in the university Bentley campus will be investigated. First, a control network surrounding the building comprising 5-6 points will be established. Plane coordinates and reduced levels of the control points will be determined and

adjusted according to the B-order control standards. Next, marks will be placed on the building from different sides and at different levels. The coordinates and levels of these marks will be determined using a total station and precise levelling. These marks will be re-observed at specific intervals (e.g. fortnightly or Monthly). Possible Changes in the coordinates and levels of the marks will be investigated to assess deformation of the building. Recoded data will be analysed, statistically examined and plotted.

DEFORMATION AND MONITORING OF SITES USING TERRESTRIAL LASER SCANNERS OR MOBILE MAPPING SYSTEMS

Supervisor: Tony Snow: 207:209, tel. 9266 4127
t.snow@curtin.edu.au

Project Description:

Deformation and monitoring of sites have always been an important aspect in surveying applications. Depending on the size and scope of the site, such methods include traditional surveying by total stations, GNSS observations, terrestrial or airbourne photogrammetry, satellite imagery and ground radar. Some of the methods suffer from complexity, sparse sampling, resolution and cost. Laser scanning systems (either terrestrial/mobile or airbourne) offer a relatively low cost method for acquiring dense point samples. As such, it is and ideal method to monitor sites, and compare repeat data to detect change over successive epochs. The goal of the project is to capture and compare data to determine it's suitable for such applications. This includes methods for modelling the data, and quantifying the level change that can be detected. Change can either be small scale change (parts of the structure deforming) or large scale movement (an entire structure).
Reference:

- Gordon, S. J. 2004, *Structural Deformation Measurement Using Terrestrial Laser Scanners*, PhD Theses, Department of Spatial Sciences, Curtin University of Technology
- Chalmers, B. S. 2011, *Deformation Measurement in Open Pit Mines using Terrestrial Laser Scanning*, Honours Dissertation, Department of Spatial Sciences, Curtin University of Technology

DIMENSIONAL (HORIZONTAL AND VERTICAL POSITIONING + TIME) MODELLING OF LEAST SQUARE ADJUSTMENTS ON CADASTRAL NETWORKS

Supervisor: Tony Snow: 207:209, tel. 9266 4127,
t.snow@curtin.edu.au
Richard Brown – Secretary of Land Surveying Licensing Board
Tel. 92737104

Project Description:

The vision of LANDGATE is to enable SmartPlan/SmartRegister to deliver a coordinated snapshot of the cadastre at any given date/time. The aim of the project is to carryout some field testing in selected areas of the metropolitan area to ascertain the accuracies of coordinates in terms of physical marks located in the ground. The WA Land Surveying Licensing Board is prepared to fund this project for up to $500 for an undergraduate project and $2000 for an Honours project.

DO GRAVIMETRIC TERRAIN CORRECTIONS AFFECT ISOSTATIC ANALYSES?

Supervisor: Dr Jon Kirby: 207:207, tel. 9266 7701, j.kirby@curtin.edu.au

Project Description:
Researchers in isostasy generally correlate observed topography with a *simple* Bouguer anomaly, in order to determine the elastic thickness. In this project you will determine the effect of terrain corrections on elastic thickness estimates, by performing an isostatic analysis with both *complete* and simple Bouguer anomalies. The project involves minor computer programming, data analysis, and image presentation.

DO WE EVEN NEED LICENSED SURVEYORS?

Supervisor: Prof Will Featherstone, Room: 207:211, 0438923018,W.Featherstone@curtin.edu.au

Project Description:
This is a deliberately controversial project. Nowadays, anyone competent with GNSS or a top-end total station can determine the dimensions of property boundaries. Potentially, they can produce the measurements with sufficient reliability for a subdivision if licensing laws were relaxed or even abandoned. In this scenario, the insurance industry could instead provide surety to legitimatise the subdivision for a premium that could be less than a licensed surveyor's fee. This project will explore this concept (or threat?) by examining scenarios from case law, the rate of boundary challenges, and the surveyor's fee versus the likely insurance premium.
University ethics clearance will be needed if the project needs interviews or personal data collection.

DOES AUSTRALIA REALLY NEED A NEW GDA?

Supervisor: Prof Will Featherstone, Room: 207:211, 0438923018, W.Featherstone@curtin.edu.au

Project Description:
The introduction of the GDA94 in 2000 arguably caused a great deal of confusion and inconvenience for the users and producers of spatial data in Australia. There are plans in preparation for the introduction of the GDA2015, with the primary rationale being that the northward plate-tectonic drift of Australia makes GDA94 incompatible with the ITRF. This project will re-examine the pros and cons of Australia adopting a new horizontal geodetic datum only 15 years since the last. This project will also explore the alternative of creating a grid that will maintain the status quo, while also allowing select users to work with the ITRF.

Reference:
Featherstone, W.E. (1996) An updated explanation of the Geocentric Datum of Australia (GDA) and its effects upon future mapping, The Australian Surveyor 41(2): 121-130, http://www.cage.curtin.edu.au/~will/composit.1.pdf

EFFECT OF DENSITY VARIATIONS ON MEAN GRAVITY AND GRAVITY GRADIENT

Supervisor: Michael Kuhn: 207:225, tel. 9266 7603, M.Kuhn@curtin.edu.au

Project Description:
The knowledge of mean gravity or mean gravity gradient inside the topographic masses is vital for the rigorous determination of orthometric heights. However, for the determination of these parameters the knowledge of the topographic masses is essential, which are not exactly known. In practice the topographic masses are often modelled by a high-resolution DEM and a constant density (e.g. 2670 kg/m^2). This project should study the effect of density variations (both lateral and vertical) on the determination of mean gravity and gravity gradient. For the determination of the latter the method of Pioncaré and Prey should be applied.

Resources: FORTRAN77 software for gravity forward modelling (Newton integration) and downward continuation of gravity anomalies, ~1.4 million gravity observations from the Australian national gravity database, GEODATA DEM over Australia (9-arc-sec by 9-arc-sec) and various global DEMs.

ELECTRONIC v PAPER FIELD NOTES: QUALITY ASSURANCE ISSUES

Supervisor: Tony Snow: 207:209, tel. 9266 4127 t.snow@curtin.edu.au

Project Description:
It is becoming a more common practice to use skew offsets and traverses to locate and set out cadastral marks and boundaries. This method is in direct contrast to the traditional method of using parallel offsets to locate and set out Cadastral boundaries, manually calculate mark placement and record all information in a field book. This is due to the traverse/skew offset method requiring access to computers and suitable software (such as Civilcad etc) to calculate cadastral connections and alignments. Generally this electronic data is downloaded onto a total station and used in the field to set out any required points. This project is designed to identify and evaluate the various methods that surveyors use to record information and develop a best practice guide that ensures that all field information is able to be checked and is recoverable at some later date.

ELLIPSOIDAL CORRECTIONS FOR THE AUSTRALIAN GEOID

Supervisor: Dr Sten Claessens, 207:333, tel. 9266 3505, s.claessens@curtin.edu.au

Project Description:
Currently, a new gravimetric geoid model for Australia is under development within the Department as a replacement of AUSGeoid98. This model will be computed using Stokes integration, which is based on a spherical approximation of the Earth. However, it is well-known that the Earth is more closely approximated by an ellipsoid of revolution. This project will numerically evaluate the errors introduced by the spherical approximation over Australia under various parameter settings.

ESTABLISHMENT OF A GRAVITY BASE-STATION AT CURTIN

Supervisor: Dr Jon Kirby: 207:207, tel. 9266 7701, j.kirby@curtin.edu.au

Project Description:
With the (fairly) recent move to Building 207, Spatial Sciences is in need of a gravity base-station. Such a station is used rather like an SSM: to tie local gravity surveys into Australia's new national gravity datum, the Australian Absolute Gravity Datum 2007 (AAGD07). The student would need to locate existing gravity base-stations within Perth's metropolitan area, and tie these in to the new Curtin station in a looping approach. The project hence comprises a few weeks fieldwork, followed by least-squares data processing, similar to GPS data processing. The student would need a valid driving licence and his/her own vehicle.

EVALUATION OF SURVEY NETWORK ADJUSTMENT SOFTWARE

Supervisor: Dr Sten Claessens, Room: 207:333, Phone: 9266 3505, s.claessens@curtin.edu.au

Project Description:
Various survey network adjustment software packages are available, such as GeoLab, StarNet, Geoida, Columbus and Move3. Each of these has different strong and weak points. This project will compare several network adjustment software packages in terms of capabilities and user-friendliness, and provide recommendations on the suitability of each to a variety of network adjustment tasks. It will also be ensured that each software package provides the same adjustment results for a small test network.

EVALUATION OF THE GLOBAL IONOSPHERIC MODELS (GIM)

Level: Honours or M.Sc. project
Supervisor: Dr. Ahmed el-Mowafy, 207:208, Phone:9266 3403, a.el-mowafy@curtin.edu.au

Project Description:
The ionosphere can be estimated at points of known coordinates using Bernese software. The estimated ionosphere will be compared with interpolated values at the same points using final and predicted GIM models. This will evaluate the accuracy and precision of the GIM models. Statistical analysis will be performed. The student needs to study the use of Bernese software, which is available in the department.

FLEXURE OF THE STIRLING RANGES, WA

Supervisor: Dr Jon Kirby: 207:207, tel. 9266 7701, j.kirby@curtin.edu.au

Project Description:
The Stirling Ranges in southern WA stand out dramatically from the surrounding plains, and are easily visible in satellite imagery. Reaching elevations of over 1000 m, these mountains undoubtedly bend the Earth's crust. The question to be answered in this project is whether this load is supported by the plate strength, or whether some form of isostatic compensation keeps them 'afloat'. Using existing gravity and topography data, and theoretical predictions of plate flexure,

you will determine the strength of the lithosphere in this region. The project involves minor computer programming, data analysis, and image presentation.

GEOID ERROR MODELLING

Supervisor: Dr Sten Claessens, 207:333, tel. 9266 3505, s.claessens@curtin.edu.au

Project Description:
Geoid models are constructed from a variety of gravity-related observations and the propagation of errors in this process is largely unknown. Knowledge of the spatial accuracy of geoid models is of crucial importance for users, but current assessment strategies are rife with problems such as unavailability of high-quality independent data. In this project, a methodology will be developed to create a spatial error model for gravimetric geoids computed using Stokes integration.

A GLOBAL COMPARISON BETWEEN TROPOSPHERIC DELAY MODELS

Level: Honours or M.Sc. project
Supervisor: Dr. Ahmed el-Mowafy, 207:208, Phone: 9266 3403, a.el-mowafy@curtin.edu.au

Project Description:
The project will compare different models used to estimate the troposphere delay of the GPS signals. Software for these models is available. Computation will be made at several IGS sites on a global coverage at points of known latitude and height. The computed total troposphere delay from the tested models will be compared with the published IGS results, used as a reference for comparison. The project includes data analysis and limited Matlab programming.

GLOBAL MEAN SEA LEVEL CHANGE OBSERVED FROM SATELLITE ALTIMETRY AND TIDE GAUGE STATIONS

Supervisor: Michael Kuhn: 207:225, tel. 9266 7603, M.Kuhn@curtin.edu.au

Project Description:
Mean sea level variation is a prominent indicator for environmental change (e.g., climate change) for more than 19 years. The TOPEX/Poseidon and follow-on Jason satellite altimeter missions have monitored the global oceans at a repeat cycle of about 10 days. The measured sea level data can be used to derive mean sea level change rates (e.g. fitting a trend). The results obtained from satellite altimetry data will be compared from mean sea level changes rates obtained from long-term tide gauge observations available.

GPS REMOTE SENSING OF AUSTRALIA's IONOSPHERE

Supervisor: Dr.-Ing. Joseph Awange: 207:228, tel. 9266 7600, J.Awange@curtin.edu.au

Project Description:
GPS radio occultations have the potential for monitoring the ionospheric behaviour on global scale and could be useful for forecasting the ionospheric impact on radio systems (e.g., GPS Positioning). This project will evaluate and validate the retrieved vertical electron density profiles (EDPs) derived from RO measurements onboard GPS Meteorology satellites CHAMP, COSMIC, GRACE,

MetOP by using vertical sounding measurements at BoM sounding stations. The project will further determine ionospheric profiles over Australia.

GRAVITY ANOMALIES OVER AUSTRALIA

Supervisor: Michael Kuhn: 207:225, tel. 9266 7603, M.Kuhn@curtin.edu.au

Project Description:
Various gravity anomalies have been proposed in order to remove the gravitational effect from topography and deeper seated massed from observed gravity observations. Apart from removing the gravitational signal from assumed to be known mass distributions in geodesy there is also the aim to generate a field of smooth anomalies in order to minimize interpolation errors between given stations. This project should derive various gravity anomalies over Australia for about 1.4 million observed gravity stations. The type of gravity anomalies considered are:

- Free air gravity anomaly
- Bouguer gravity anomaly
- Isostatic gravity anomaly according to Partt-Hayford
- Isostatic gravity anomaly according to Airy-Heiskanen
- Isostatic gravity anomaly according to Vening Meinez
- Gravity anomalies according Helmert's 1^{st} and 2^{nd} condensation method

Apart from deriving the above gravity anomalies the project should analyse the spatial variability of each type.
Resources: FORTRAN77 software for gravity forward modelling (Newton integration), ~1.4 million gravity observations from the Australian national gravity database, GEODATA DEM over Australia (9-arc-sec by 9-arc-sec)

GYRO THEODOLITE ACCURACY

Supervisor: Tony Snow: 207:209, tel. 9266 4127, t.snow@curtin.edu.au

Project Description:
The gyro theodolite is an important piece of equipment for the underground mine surveyor. In many instances it is the only method a surveyor can angularly close an underground traverse. The aim of the project is to ascertain the absolute accuracy of an azimuth obtained from a Gyro theodolite (Sokkia or Leica) using the different observing techniques available. In addition the study should also look at the minimum observing time required to obtain certain levels of precision.

HOW NORTH DO GNSS ANTENNAS HAVE TO BE?

Supervisor: Prof Will Featherstone, Room: 207:211, 0438923018, W.Featherstone@curtin.edu.au

Project Description:
Good GNSS survey practice is to orient the antennas to north so that common phase-centre-related errors cancel, but how accurately do the antennas have to be oriented? Using the GNSS calibration baselines on Curtin University's campus, the student will conduct field experiments to answer this question. One antenna will be oriented exactly north and the other rotated, say in 10-degree increments and baselines processed to determine the effect, if any. This will provide useful advice to GNSS surveyors on the tolerance to within which they have to set up antennas.

HOW RELIABLE IS THE FREMANTLE TIDE GAUGE FOR SEA-LEVEL CHANGE PREDICTIONS?

Supervisor: Prof Will Featherstone, Room: 207:211, 0438923018, W.Featherstone@curtin.edu.au

Project Description:
The Fremantle tide gauge has one of the longest records of sea level measurement in the Southern Hemisphere (since 1897). As such, it is relied upon heavily in studies of sea-level response to climate variability. However, the instrumentation has been upgraded over the years and the vertical datum connections are sometimes ambiguous. This project will examine the history of the Fremantle site with a view to providing a clear geodetic description of the tide gauge and its datum so as to correct long-period sea-level change estimates.

Reference:
Church JA, White NJ (2006) A 20th century acceleration in global sea-level rise, Geophysical Research Letters 33, L01602, doi:10.1029/2005GL024826, http://www.agu.org/journals/ABS/2006/2005GL024826.shtml

HOW WELL CAN GNSS NOW DETERMINE HEIGHT CHANGES?

Supervisor: Prof Will Featherstone, Room: 207:211, 0438923018, W.Featherstone@curtin.edu.au

Project Description:
GNSS is intrinsically weak for the determination of heights, but they are still used. This project will examine how useful GNSS really is for determining height changes. Using a precision-engineered platform that can be translated vertically to within a millimetre, the student will collect GNSS data from antenna mounted on the platform and compare the GNSS-determined height change with the precisely known amount. This will help ascertain what height changes can be resolved and for how long a GNSS receiver must collect data to determine that height change.

HOW WELL DO THE SCDB COORDINATES HOLD FOR RE-ESTABLISHMENT USING GPS FROM DISTANT SSMS OR BASE STATIONS?

Supervisor: Tony Snow: 207:209, tel. 9266 4127, t.snow@curtin.edu.au

Project Description:
The project aim is to quantify the accuracies of using distant GPS base stations and the SCDB coordinates to use in reestablishment of Cadastral boundaries. For example, if you had a base station in Midland, and you re-established the boundaries of an SSA at Wanneroo using the SCDB coords, how close to the actual marks would you get? Perhaps a more realistic example would be re-establishing within Brighton from the closest SSMs rather than using the direct connections from the PSMs/PCMs. The WA Land Surveying Licensing Board is prepared to fund this project for up to $500 for an undergraduate project and $2000 for an Honours project.

IMAGERY AND POINT CLOUD CO-REGISTRATION

Supervisors: Tony Snow: 207:209, tel. 9266 4127
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Geoff West: 207:302A, tel. 9266 4695
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Project Description:
Laser scanning systems are seeing increasing adoption to traditional problems because of the quick and efficient capture of large volumes of 3D point coordinate data. With the registering of imagery to the point data, the information available can be increase from purely geometric information with the inclusion of spectral information in the forms of RGB colour channels. Due to the limit availability of colour information, it is often under utilised in processing point cloud data, especially where an in built camera is not present.

The aim of the project will be to use external imagery and map the pixel information onto the point data. This can be comprised of several steps involving: identifying targets or coincident pixels and 3D points, solving the exterior orientation or mapping parameters between the imagery and point data, and applying the colour information to the point cloud data, or conversely applying depth information from the point cloud to the imagery. In the case of multiple images and highly divergent geometry between the scanner and camera, a method could be explored to identify incorrectly mapped pixels and points.
References

- Abdelhafiz, A. and Niemeier, W. 2006, “Developed technique for automatic point cloud texturing using multi images applied to a complex site”, *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences* XXXVI (part 5), pp. 1–7.

INDEPENDENT TESTING OF AUSGEOID09 AND AGQG2009

Supervisor: Prof Will Featherstone, Room: 207:211,
0438923018, W.Featherstone@curtin.edu.au

Project Description:
AUSGeoid09 is the new national standard for Australia, which was computed using techniques and software developed at Curtin University. Unlike AUSGeoid98, it has been tailored to fit the AHD using GNSS data at about 6,000 points nationwide. Our tests indicate that it can deliver AHD heights from GNSS to within 3-5cm, but this needs independent verification. The student will use existing and newly acquired GNSS data to independently verify the precision of AUSGeoid09 and its gravimetric-only counterpart AGQG2009, with particular focus on the Perth region, where the geoid slopes very steeply (up to 10cm per km).

Reference:
Featherstone WE, Kirby JF, Hirt C, Filmer MS, Claessens SJ, Brown NJ, Hu G, Johnston GM (2010) The AUSGeoid09 model of the Australian Height Datum, Journal of Geodesy 85(3): 133-150,
http://www.cage.curtin.edu.au/~will/10.1007_s00190-010-0422-2.pdf

INTENSITY MODELLING

Supervisors: Tony Snow: 207:209, tel. 9266 4127
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Geoff West: 207:302A, tel. 9266 4695
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Project Description:
Laser scanning systems are seeing increasing adoption to traditional problems because of the quick and efficient capture of large volumes of 3D point coordinate data. With the registering of imagery to the point data, the information available can be increase from purely geometric information with the inclusion of spectral information in the forms of RGB colour channels. Another source of spectral information is the return intensity value from the laser. Additional information can be derived based on the wavelength, of the data, especially in the case where the wavelength is in the near infra-red range where it can be used to help classify vegetation. However, this information is not often utilise, because the intensity return is heavily influenced by atmosphere, range and incident angle, as well as surface properties including texture and reflectivity.

The focus of this project would be to create or use existing models of laser behaviour to create a normalisation method. This method would eliminate additional effects such as range and incident angle so that the return signal would be affected only by surface properties. The information could then be used to help differentiate between surface types and classify points.
References

- Holfe, B. and Pfeifer, N. 2007, "Correction of laser scanning intensity data: data and model-driven approaches", *ISPRS Journal of Photogrammetry and Remote Sensing*, Vol 62, pp 415-433

IS EXPANSION AND CONTRACTION OF CLAY RESPONSIBLE FOR APPARENT MOTION ON THE DARLING FAULT?

Supervisor: Prof Will Featherstone, Room: 207:211,
0438923018, W.Featherstone@curtin.edu.au

Project Description:
The Darling Fault is a 15-km-deep near-vertical fault that separates the Perth Basin from the Yilgarn Craton. At present it is seismically inactive, but spirit-levelling surveys suggest that there could be motion along parts of the fault. If the fault were to become seismically active, this could be potentially disastrous for the 1.7-million population of Perth. One candidate for the apparent motion is seasonal expansion and contraction of the Guildford Clay formation with groundwater recharge. This project will map the extent of the Guildford Clay formation, correlate it with geodetic observations of apparent motion, and quantify the likely amount of hydromechanical expansion and contraction.

IS MOTORISED LEVELLING FEASIBLE IN AUSTRALIA?

Supervisor: Prof Will Featherstone, Room: 207:211,
0438923018, W.Featherstone@curtin.edu.au

Project Description:
Spirit-levelling is a slow process, even when using digital barcode levels. Transporting the level and staves on vehicles can significantly accelerate the

process. This project will review the usage of motorised levelling, which is used commonly in Europe, and then devise a system for use in Australia. It will include the option of using two sets of observers to effectively get forward and reverse sections with only a single traverse. Time permitting, a prototype system will be tested over a previously observed levelling traverse. If the concept is proved, motorised digital barcode levelling may become attractive for large levelling projects.

Reference:

Becker, J-M. (1985) The Swedish experience with motorized levelling, Technical Report, National Land Survey of Sweden, Gavle, http://www.lantmateriet.se/upload/filer/kartor/geodesi_gps_och_detaljmatning/Rapporter-Publikationer/LMV-rapporter/1985-7.pdf

LASER SCANNING TARGET MEASUREMENT AND RESECTION OF TARGET NETWORKS

Supervisor: Tony Snow: 207:209, tel. 9266 4127
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Project Description:

Registration of laser scanner point clouds requires precise measurement of signalised targets or other identified feature points. Often these comprise a highly reflective circle centred on a dark magnetic background, or a feature with defined geometric or spectral properties. The algorithms embedded in commercially-available software are often unknown. Additional, each of these targets must be identified and label correctly in order to register individual scan clouds together. Distances between targets can be used and compared to match and label targets from different scans, without the need for manual labelling, as well as other coding methods. This project will entail implementation and testing 2D or 3D circle fitting routines and comparison with results from proprietary software, in addition to identifying alternative features for registration and implementing a target matching method to automatically match targets without the need for manual labelling.

References:

- Beinat, A., Crosilla, F., Sepic, F., 2006. Automatic morphological pre-alignment and global hybrid registration of close range images, in: *IAPRS&SIS*, XXXVI(5), Dresden

MAP AIDING GPS POSITIONING UNDER LOW SATELLITE VISIBILITY CONDITIONS

Level: Undergraduate or Honours project

Supervisor: Dr. Ahmed el-Mowafy, 207:208, Phone: 9266 3403, a.el-mowafy@curtin.edu.au

Project Description:

Real-time positioning by GPS requires simultaneous observation to four or more satellites. This might not be achievable when working near tall buildings or under tree canopies. This project will evaluate the use of known mapping data such as point heights to aid GPS positioning in such environment. Approximate positioning data will be utilized as extra information to aid GPS observations to estimate 3D positions.

METHODS FOR DIRECT GEO-REFERENCING OF TERRESTRIAL LASER SCANNING

Supervisor: Tony Snow: 207:209, tel. 9266 4127
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Project Description:
Terrestrial Laser Scanners (TLS) have seen an increasing adoption for traditional surveying applications. One such application is the acquisition of large volumes of data for repeat measurements in remote sites. In such cases, permanent control for repeat surveys may not always be available or practical to implement.
A simple method to introduce control between repeat scans is by creating temporary survey network by GNSS observations that the scan data could be geo-reference to. The project would then be aimed at examining the effect of the network size and configuration, as will as the propagation of errors from the GNSS observations into scan data, and the level of accuracy achieved between repeat scans.

An alternative method is to create a static system configuration between a TLS and one or more GNSS receivers. This would allow the observations from the TLS and the GNSS receivers to be combine to allow direct geo-referencing of the scan data. The project would be aims at creating such a setup, and determining the effects of errors of instruments on the scan data, and the level of accuracy achieved between repeat scans.
Reference:

- Paffenholz, J.-A., Kersten, T., Schon, S. And Kutterer H. 2011 “Anaysis of Impact of Rotating GNSS Antennae in Kinematic Terrestrial Applications”, *FIG Working Week 2011 -Bridging the Gap Between Cultures*, Marrakech, Morocco
- Reshetyuk, Y. 2009 *Self-calibration and direct georeferencing in terrestrial laser scanning*, PhD Thesis, Department of Transport and Economics, Division of Geodesy, Royal Institute of Technology (KTH)

OPEN PIT MONITORING USING A COMBINATION OF GPS AND TERRESTRIAL DATA: THE BENEFITS OF USING BOTH TO MANAGE MONITORING DATA

Supervisor: Tony Snow: 207:209, tel. 9266 4127,
t.snow@curtin.edu.au

Project Description:
This project is aimed at comparing the accuracies of a mobile GPS/Total Station monitoring system with a traditional static monitoring system in an open pit environment. In large pits it is now becoming extremely hard to maintain distance and angle precision from stations located on opposite pit walls. A solution to this problem is to use GPS to locate temporary monitoring points close to the area that requires monitoring. The work will involve using real pit observational data in conjunction with SMI Australia Pty Ltd mobile system.

OPTIMAL DEM RESOLUTION IN TERRAIN CORRECTION DETERMINATION

Supervisor: Michael Kuhn: 207:225, tel. 9266 7603, M.Kuhn@curtin.edu.au

Project Description:
In order to determine global terrain corrections digital elevation models (DEMs) of various resolutions can be used in order to represent the global topographic masses. Here a coarser resolution is taken for masses further away from the computation point. In this project, optimal radii will be estimated for which the resolution can be changed to a coarser one omitting an approximation error, which is smaller than a given threshold (e.g. 1 microGal). Suitable software based on existing routines will be written to solve the above question.

OPTIMAL SPATIAL RESOLUTION OF DEEP-SEATED MASS DISTRIBUTIONS FOR FORWARD GRAVITY MODELLING

Supervisor: Michael Kuhn: 207:225, tel. 9266 7603, M.Kuhn@curtin.edu.au

Project Description:
The primary drawback of forward gravity field modelling is that the Earth's density distribution must be known. Nowadays, increasingly more information on the Earth's mass distribution is available, such as digital elevation models (DEMs), models of crustal and deeper mass distributions. While there are high resolution are available for the topography only rather low-resolution data are available for deeper mass distributions such as the Earth's crust and mantle. This study should examine the optimal spatial resolution of deeper-seated mass distributions required in forward gravity field modelling using spherical harmonic expansions of global data. The spectral sensitivity of different gravity field parameters should be examined by means of empirical and analytical degree variances. Numerical results for the gravitational potential, geoid height and gravity should be provided. This project is practically a continuation of a study focusing on topographic and crustal masses only.
Resources: Various FORTRAN77 software and c-shell scripts as well as geophysical data for the Earth's crust and mantle.

QUALITY CONTROL AND VALIDATION OF GNSS OBSERVATIONS

Level: Honours or M.Sc. project
Supervisor: Dr. Ahmed el-Mowafy, 207:208, Phone:9266 3403, a.el-mowafy@curtin.edu.au

Project Description:
Quality control methods for GPS measurements will be investigated. The performance of a method developed in Curtin University utilizing a single-receiver single-satellite approach will be evaluated using data from a wide range of receivers, using different frequency/measurement types from the GNSS systems, such as the existing GPS and GLONASS systems, and the new Galileo, COMPASS and QZSS systems. Software is available. Statistical data analysis will be performed.

SPECTRAL CLASSIFICATION OF 3D POINT CLOUD

Supervisors: Tony Snow: 207:209, tel. 9266 4127
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Geoff West: 207:302A, tel. 9266 4695
g.west@curtin.edu.au

Project Description:
Laser scanning systems are seeing increasing adoption to traditional problems because of the quick and efficient capture of large volumes of 3D point coordinate data. With the registering of imagery to the point data, the information available can be increase from purely geometric information with the inclusion of spectral information in the forms of RGB colour channels. Due to the limit availability of colour information, it is often under utilised in processing point cloud data. Another source of spectral information is the return intensity value from the laser. Additional information can be derived based on the wavelength, of the data, especially in the case where the wavelength is in the near infra-red range where it can be used to help classify vegetation.

The aim of this project would be on applying traditional remote sensing techniques to the point cloud data, including colour and intensity return depending on availability. This could focus on supervised learning techniques using training data, and also the incorporation of atmospheric, range and incident angle observations to limit external affects.
References

- Lichti, D. D. 2005. “Spectral filtering and classification of terrestrial laser scanner point clouds”, *The Photogrammetric Record* , Vol 20(111), 218–240.

THE PITFALLS OF ON-LINE GNSS DATA PROCESSING

Supervisor: Prof Will Featherstone, Room: 207:211, 0438923018, W.Featherstone@curtin.edu.au

Project Description:
There are now several on-line GNSS data processing services, such as NASA’s AutoGIPSY, Geomatics Canada’s CSRS and Geoscience Australia’s AUSPOS. However, if the RINEX data format is not exactly what the service expects, spurious results can be returned with no warning to the user. This project will test these services using GNSS data collected by the student or existing GNSS data held at Curtin. This will involve modifying the RINEX files to see how easy it is to ‘break’ the on-line GNSS data processing services.

Reference:
Ebner, R. and W.E. Featherstone (2008) How well can online GPS PPP post-processing services be used to establish geodetic survey control networks? Journal of Applied Geodesy 2(3): 149-157, http://www.cage.curtin.edu.au/~will/JAG_149-157.pdf

PROPORTIONING EXCESS AND DEFICINECY ACROSS CADASTRAL BOUNDARIES

Supervisor: Tony Snow: 207:209, tel. 9266 4127, t.snow@curtin.edu.au
Richard Brown – Secretary of Land Surveying Licensing Board (tel. 92737104)

Project Description:
Under the Transfer of Land Act (1996) any excess or deficiency between reliable survey marks is to be proportioned out to each lot based on its area. This is contrary to Common law that recognises occupation as an important piece of Cadastral boundary evidence. The objective of the project is ascertain the potential problems associated with the adoption of the act in over ruling the evidence of Occupation. Part of the research will involve analysis of any WA court rulings on this subject as well as looking at surveying practice in this area in other states across Australia. A practical component of the project would be to survey a known area in Perth where know occupation problems are thought to be present so as to demonstrate the problems and acceptable solutions.

SEA LEVEL VARIABILITY OBSERVED FROM SATELLITE ALTIMETRY

Supervisor: Michael Kuhn: 207:225, tel. 9266 7603, M.Kuhn@curtin.edu.au

Project Description:
The TOPEX/Poseidon and follow-on Jason satellite altimeter missions have monitored the global oceans at a repeat cycle of about 10 days since 1992. The measured sea level data are taken in this project to study the most dominant spatial and temporal variation of the global sea level. Here the spatial-temporal data set (sea level data) will be examined by a principal component analysis (PCA). This project should perform a PCA of sea level measurements and summarise the results.

SPATIO-TEMPORAL ANALYSIS OF PERTH'S FUEL PRICES

Supervisors: Michael Kuhn: 207:225, tel. 9266 7603, M.Kuhn@curtin.edu.au
Rob Corner: 207:227, tel. 9266 7605, R.Corner@curtin.edu.au

Project Description:
Since January 2001 FuelWatch (http://www.fuelwatch.wa.gov.au/) monitors the daily petrol prices at all petrol stations in Western Australia. In this project petrol prices available for the Perth metropolitan area over almost one decade should be analysed regarding the spatial and temporal variability. This should be done by employing the statistically-based Principal Component Analysis (software is available, e.g. R-Project statistical software http://www.r-project.org/ or FORTRAN77 software code) commonly used in geosciences applications such as in meteorology and oceanography.
Resources: Software for PCA and statistical analysis

SPECIAL SURVEY AREAS

Supervisor: Tony Snow: 207:209, tel. 9266 4127, t.snow@curtin.edu.au
Richard Brown – Secretary of Land Surveying Licensing Board
tel. 92737104

Project Description:
SSA regulations were formulated to provide a new reference marking system based on coordinates for new large scale subdivisions. The rational behind the SSA was to improve the percentage of survivability of key reference marks that are necessary for the reestablishment of cadastral boundaries in the future. This project is a study of some of the earlier SSA's to determine what Permanent Survey Marks (PSM) and RM's have survived and if these remaining marks are still able to meet the accuracy standards in the SSA guidelines. The WA Land Surveying Licensing Board is prepared to fund this project for up to $500 for an undergraduate project and $2000 for an Honours project.

SPECTRAL CHARACTERISTICS OF EROSION – LITERATURE REVIEW

Supervisor: Dr Jon Kirby: 207:207, tel. 9266 7701, j.kirby@curtin.edu.au

Project Description:
When topography is eroded by the action of water or wind, how does this change its spectral properties? That is, does erosion act to reduce the large-scale topographic features, the smaller features or does it reduce the amplitude of all features equally at all scales? In this project, you will search for and summarise existing literature in peer-reviewed journals, and perhaps draw your own conclusions.

SUBSIDENCE IN THE PERTH BASIN: WHAT DOES THE GEODETIC EVIDENCE TELL US?

Supervisor: Prof Will Featherstone, Room: 207:211, 0438923018, W.Featherstone@curtin.edu.au

Project Description:
The Perth Basin is subsiding at approximately 5 mm per year, which has been measured by InSAR (Interferometric Synthetic Aperture Radar) and continuously operating GNSS. The subsidence has been caused principally by extraction of groundwater from the Yarragadee aquifer. This in turn causes an apparent rise in sea level, which has possibly led to some incorrect predictions of climate-related sea level change. This project will assist in the determination of the extent and rates of subsidence across the Perth Basin, then make a revised estimate of sea level change in the region.

Reference:
Featherstone, W.E., M.S. Filmer, N.T. Penna, L.M. Morgan and A. Schenk (submitted Dec 2011) Anthropogenic land subsidence in the Perth Basin: challenges for its retrospective geodetic detection, *Journal of the Royal Society of Western Australia*

SURVEY NETWORK DESIGN

Supervisor: Dr Sten Claessens, 207:333, tel. 9266 3505, s.claessens@curtin.edu.au

Project Description:
The design of survey networks that meet certain accuracy, reliability and economic criteria is usually performed by means of a trial-and-error procedure using standard least-squares network adjustment software such as Geolab. This project will evaluate the technical and practical possibilities of improving the design procedure by making the software provide specific feedback to the user related to potential network improvement.

SWSZ GNSS SURVEY

Supervisor: Prof Will Featherstone, Room: 207:211, 0438923018, W.Featherstone@curtin.edu.au

Project Description:
In 2012, Geoscience Australia and Landgate will re-observe a GNSS network across the South West Seismic Zone (SWSZ) that was first observed in 2002. The SWSZ covers the south-west of the state and hosted the 1968 Meckering earthquake. If feasible, the student will participate in the field surveys, thus gaining practical experience in geodetic GNSS surveying, and process some of the data using a commercial package to determine if any ground motion has occurred in the SWSZ over the past decade.

Reference:
Featherstone, W.E., N.T. Penna, M. Leonard, D. Clark, J. Dawson, M.C. Dentith, D. Darby and R. McCarthy (2004) GPS-geodetic deformation monitoring of the south-west seismic zone of Western Australia: review, description of methodology and results from epoch-one, Journal of the Royal Society of Western Australia 87(1): 1-9. http://www.cage.curtin.edu.au/~will/JRSWA-SWSZ.pdf

TESTING THE SPECIFICATIONS AND STANDARDS OF THE CORS NETWORK IN WA

Supervisor: Tony Snow: 207:209, tel. 9266 4127, t.snow@curtin.edu.au
Richard Brown – Secretary of Land Surveying Licensing Board
tel. 92737104

Project Description:
The Continuously Operating Reference Stations (CORS) network in the process of being established in WA . The research is to test the CORS network to determine if the specified Licensed Surveyor's regulations for positional tolerances can be met using a single receiver throughout the State. Part of the study will also involve research into how surveyors and others are using this network. The WA Land Surveying Licensing Board is prepared to fund this project for up to $500 for an undergraduate project and $2000 for an Honours project.

TESTING THE VRS NETWORK FOR CADASTRAL SURVEYING

Supervisor: Tony Snow: 207:209, tel. 9266 4127
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Richard Brown – Secretary of Land Surveying Licensing Board
tel. 92737104

Project Description:
The project is designed to test the suitability and accuracies of the new VRS network for Cadastral work within the Metropolitan area. Testing will include connecting to existing SSM's, PSM and PCM points in the new and older SSA subdivisions. The testing procedure will also look at the type of equipment available, observing procedures and the number of epochs required. The outcome of the project will be recommendations on methods of survey and any applicable redundancies and restrictions in its use.

TOTAL STATION LEVELLING OR SPIRIT LEVELLING: WHICH IS BEST?

Supervisor: Prof Will Featherstone, Room: 207:211, 0438923018, W.Featherstone@curtin.edu.au

Project Description:
Total station levelling is being used to monitor the vertical stability of Australian tide gauges in the SEAFRAME project. However, the method has not been tried and tested exhaustively, especially over longer distances. This project will take the opportunity to observe part, most or all of a second-order levelling traverse that was observed by Landgate between Gnangara and Hillarys in 2011. This will help ascertain the utility of total station levelling as an alternative to conventional methods for monitoring height changes.

Reference:
Johnston, G.M., B. Twilley and S. Yates (2002) Total station levelling. *Proceedings of the 26th National Surveying Conference of the Institution of Engineering and Mining Surveyors pp.* 4-8.

TRANSFORMATION FROM CARTESIAN TO GEODETIC COORDINATES

Supervisor: Dr Sten Claessens, 207:333, tel. 9266 3505, s.claessens@curtin.edu.au

Project Description:
The transformation from Cartesian to geodetic coordinates is extremely common in many applications, e.g., GPS processing. Many algorithms for the transformation exist, which differ in terms of accuracy, stability and computation time. In this project, a comparison of several algorithms will be carried out. This will involve a numerical simulation.

WALL STATIONS IN UNDERGROUND MINING – A DECADE OF USE

Supervisor: Tony Snow: 207:209, tel. 9266 4127, t.snow@curtin.edu.au

Project Description:
Wall stations have now been used in WA underground mines for the past 10 years. These stations involve a different observing technique and positional philosophy to the more traditional back station control points used in the past.

The aim of the project is to analyse a number of existing underground mining networks that use both methods to ascertain problems, in terms of accuracy or reliability, which may have become evident using the wall station method.

WHAT IS THE DISTANCE TO THE HORIZON?

Supervisor: Prof Will Featherstone, Room: 207:211, 0438923018, W.Featherstone@curtin.edu.au

Project Description:
This project was inspired by a court case in which the supervisor gave expert evidence. The distance to the visual horizon depends on the height of the observer, the height of the horizon, the curvature of the Earth and atmospheric refraction. This project will take the most precise formulas from trigonometric heighting to come up with a general formula for the distance to the horizon that includes subtle effects like the variation of curvature of the Earth with azimuth.

GIScience/Cartography/Remote Sensing

AN INVESTIGATION OF FREE AND OPEN SOURCE GIS SOFTWARE

Supervisor: Robert Corner: 207:227, tel. 9266 7605, R.Corner@curtin.edu.au

Project Description:
A number of free GIS software packages exist. Some are Open Source and some whilst free are not Open Source. This project will investigate the usefulness of several of these packages under a range of scenarios to answer, amongst others, the following questions.

Is Open Source better than just Freeware?
Do any of the packages represent serious competition to industry standard programs such as ArcGIS?

BUILDING A NEARMAP API APPLICATION

Supervisor: Prof Bert Veenendaal, Phone: 9266 7565, B.Veenendaal@curtin.edu.au
Level: undergraduate

Project Description:
High resolution aerial imagery is obtained by Nearmap over the Perth metropolitan area approximately every month. Hence it is possible to obtain imagery over both space and time. This project will develop a small application that uses the Nearmap API to extract imagery in both space and time. The project will require programming skills and some knowledge of JavaScript.

BUILDING A WEB PROCESSING SERVICE

Supervisor: Prof Bert Veenendaal, Phone: 9266 7565, B.Veenendaal@curtin.edu.au
Level: undergraduate, honours

Project Description:
A range of web services are available, providing users with access to geospatial maps and data via WMS and WFS. The newer sister of these OGC web services standards is the Web Processing Service (WPS) standard. The objective of this project is to investigate the use and implementation of WPS within a GIS application. Students will become familiar with the details of the standard, and be able to implement it for a GIS function within an application.

BUILDING 3D MAPS OF THE INDOOR ENVIRONMENT

Supervisor: Prof Geoff West, Room: 207-302a, Phone: 9266 4695, g.west@curtin.edu.au

Project Description:
Point Grey produces a small trinocular camera (three cameras in a line) that produces reasonable depth maps. This project, jointly run with the Department of Computing, will investigate the use of this camera for the mapping of an indoor environment. The objective is to be able to acquire video data using the camera as a hand held device and to fuse the depth maps from the video to produce a reasonable representation of the indoor environment. Algorithms will need to be investigated for registration of the depth maps. The camera comes with an API

that is accessible from languages such as C++ and C#. Code is available from a previous project that will help the student get up to speed. The project will be run jointly with A/Prof T. Tan of the Department of Computing at Curtin.

CARTOGRAPHIC WEB PAGE

Supervisor: Mike Tassell: 207:335, tel. 9266 7601, M.Tasselll@curtin.edu.au

Project Description:
To explain and demonstrate the cartographic principles involved in the design of a tourist map web page. It shall involve the creation of a web page showing a particular tourist location and its major attractions. Photographs and dynamic zoom applications must be employed. 'Fly- throughs' may be considered to add further dynamics to the presentation.

COLOUR IN CARTOGRAPHY

Supervisor: Mike Tassell: 207:335, tel. 9266 7601, M.Tasselll@curtin.edu.au

Project Description:
How does the psychology in colour awareness impact upon the design of full colour printed maps and full colour presentation on the screen? The discussion should examine both the CMYK and RGB processes in the psychological reactions to colour from the printed map to website, Ipod and GPS navigation screens. As well, factors of age and the environment should be integrated into the discussion.

Reference:

1. A. H. Robinson (1967), "Psychological Aspects of Colour in Cartography", *International Yearbook of Cartography, 7, pp 50-59.*
2. H. Varley (1980), Colour, A Marshall Edition, London.

CONSTRUCTION OF A DIGITAL DENSITY MODEL OF AUSTRALIA

Supervisor: Dr Jon Kirby: 207:207, tel. 9266 7701, j.kirby@curtin.edu.au

Project Description:
Analogous to a digital elevation model, a digital density model contains surface and near-surface rock density values on a regular grid covering the continent, with an estimated resolution of 12.5 km. Derived primarily from geological maps (but also well-log and seismic data if time permits), the model has its greatest application in the fields of geophysical exploration and gravimetric geoid determination, through improvement of computed Bouguer anomalies and terrain corrections. The project involves digitisation and computer work.

CROWD SOURCING FOR BUILDING MAPS

Supervisor: Prof Geoff West, Room: 207-302a, Phone: 9266 4695, g.west@curtin.edu.au

Project Description:
Recently there has been an increase in interest in building various types of map from information mined from email, twitter and facebook feeds. Importantly this must have some spatial information embedded in the data. A popular method is

Ushahidi (http://ushahidi.com) that consists of tools for information gathering, visualization and interactive mapping. This project will be concerned with exploring the capabilities of these tools to build maps that represent various activities and events in the Perth and South West region.

CURTIN UNIVERSITY GIS CRASH RESEARCH PROJECT – ANALYSIS OF CRASHES WITHIN AND IN THE VICINITY OF SCHOOL ZONES IN THE PERTH METROPOLITAN AREA.

Supervisor: Cecilia Xia 207:332, tel. 9266 7563, c.xia@curtin.edu.au

Project Description:
This project will identify crashes within the school zones in the Perth Metropolitan Area and those in the proximity of the zones based on distances on the network to identify hot spots related to school zones. The analysis will be done for both during times of operation and outside the times of operation of the school zones. Crashes related with the school zones will be analysed based on crash year, severity, pedestrians involved, unit type, other crash parameters and speed zones. School zones with a significant number of crashes within the zones or in their vicinity will be further investigated to determine the adequacy of safety features provided.

CURTIN UNIVERSITY GIS CRASH RESEARCH PROJECT – CRASH DENSITY METHODS FOR RURAL ROADS

Supervisor: Cecilia Xia 207:332, tel. 9266 7563, c.xia@curtin.edu.au

Project Description:

This project will investigate the application of kernel density estimation methods for networks on serious single vehicle accidents on state roads in rural areas and develop a general method that can be applied in various contexts to evaluate road safety concerns. The project will investigate methods of calculating crash density which accurately represent the underlying crash distribution, as well as developing a suitable graphical representation that is easily interpretable.
The context for the development of the method will be the investigation of the relationship between road shoulder width and crash risk. There is a large body of evidence which suggests that narrow and unsealed road shoulders are a significant risk factor (Austroads, 2005).

DETAILED MAPPING OF NATIVE VEGETATION IN THE PORONGURUPS

Supervisor: Dr Tom Schut, Room 207-331, Phone: 9266 2691, t.schut@curtin.edu.au

Project Description
The Porongurup ranges are an important granite outcrop area with many endemic plant species. It is currently a refuge for the iconic Kari trees, far to the east of their normal range of occurrence. Currently, there is a need to create a detailed vegetation map for management and benchmarking purposes. This project will map native vegetation and explore options to use vertical vegetation profiles derived from discrete return LiDAR datasets in combination with optical imagery to characterise these Kari trees. Detailed RGB imagery and profiles of LiDAR data are already generated and available as GEOTIFF files.

DEVELOPING SITUATIONAL AWARENESS IN A DISASTER EVENT

Supervisor: Prof Bert Veenendaal, Phone: 9266 7565, B.Veenendaal@curtin.edu.au
Level: honours

Project Description:
Over the recent years, a number of major disasters have occurred including earthquakes, tsunamis, cyclones, etc. In all cases, the damage and effects to people and infrastructure has been severe. The developing technologies of Web 2.0, crowdsourcing, sensors, web mapping, location based services, positioning, etc. have supported the integration of a wider range of data sources over a shorter period of time in order to assess the situation and respond appropriately. This project investigates and develops a taxonomy of knowledge, identifying the extent, diversity and interrelationships of information that can be used in developing situation awareness in disaster events.

ESTABLISHMENT OF A GEOSERVER WEB SERVICE

Supervisor: Prof Bert Veenendaal, Phone: 9266 7565, B.Veenendaal@curtin.edu.au
Level: undergraduate, honours

Project Description:
GeoServer is a Free and Open Source Software (FOSS) mapping server that provides a means of viewing and editing geospatial data over the web. GeoServer implements both the WMS and WFS Open Geospatial Consortium (OGC) standards and can integrate with many popular mapping applications such as Google Maps, Google Earth, Microsoft Virtual Earth and ESRI ArcGIS. This project involves the establishment of a web service using GeoServer.

HOW DO ICONIC WA TREES MEASURE UP?

Supervisor: Mr Tony Snow, Room 207-209, Phone: 9266 4127, t.snow@curtin.edu.au
Dr Tom Schut, Room 207-331, Phone: 9266 2691, t.schut@curtin.edu.au

Project Description
The south-west of WA is blessed with a couple of giant endemic trees that are true icons of the region, e.g. Karri, Jarrah and Tingles. But do the tallest trees contain the largest volume of carbon and how does this compare with other iconic trees of the world? In this project, state of the art terrestrial laser scanners will be used to visualise a selected number of trees in 3D. The total tree volume, including trunks and branches, will be compared to identify which tree contains the most carbon and if there are differences in distribution of carbon within the tree. In addition the scanning and mapping of these ionic trees will attract the interest of a wide public audience. Required field trips will be organised in collaboration with G. Wardell-Johnson.

INVESTIGATE THE RELATIONSHIP WITH PEDESTRIAN INJURIES AND THE ROAD ENVIRONMENT IN CENTRAL CITY AREAS

Supervisor: Cecilia Xia 207:332, tel. 9266 7563, c.xia@curtin.edu.au

Project Description:
This project will investigate the Relationship of Pedestrian Injuries with the Road Environment in Central City Areas. The study will explore the spatial clustering of crash locations of the non-behaviour crashes and relate them to the significant parameters of the Road Environment. The major parameters that will be considered are Speed Zones, Number of Lanes, Traffic Signals, Crossing Facilities, Day of Week, Time of Day, Pedestrian Counts, Proximity to Old Age Facilities, Sites of pedestrian concentration such as shopping centres and Distance from the Pedestrian place of Residence (suburb)

The project objective is to identify the locations of significant Pedestrian Injuries in Central City Areas and relate them with other road information in order to identify and recommend interventions to minimise or eliminate risk of pedestrian injuries.

Crash data for the last five years (2004-2009) will be used in the study. Both spatial and temporal analysis will be undertaken to investigate trends relating to the most significant correlations established by the study. The trends will be compared with the measures that have already been implemented to minimise risk of pedestrian injuries where appropriate..

INVESTIGATE THE CORRELATION BETWEEN NOVICE DRIVERS AND DISTANCE FROM DRIVER'S PLACE OF RESIDENCE.

Supervisor: Cecilia Xia 207:332, tel. 9266 7563, c.xia@curtin.edu.au

Project Description:
This project will carry out research on crashes involving novice drivers (L and P platers) in both Metropolitan and Rural areas. Research includes identifying cause of crash, (speed, alcohol, seatbelt, fatigue, inattention, environment, driver behaviour etc.) in relation to the distance from the location of the crash to the driver's residential address.

Two separate analyses carried out for both crashes involving novice drivers and crashes involving experienced drivers and compare the results between two groups

The project objective is identify the cause of crash, location analysis for crashes involving novice drivers in Western Australia and recommend interventions (safety measures, training & education etc.) to minimise risk.

INVESTIGATING THE CAPABILTIES OF NEARMAP AERIAL DATA

Supervisor: Prof Geoff West, Room: 207-302a, Phone: 9266 4695, g.west@curtin.edu.au

Project Description:
A Perth company has developed a novel technique to acquire high resolution of aerial data of major cities. Importantly the data is acquired on a regular basis: once every month or so and has a resolution of 7.5cm. The data is in the form of

colour images as well as height data determined using stereo. This data is freely accessible using an API similar to that for Google maps and the image data can be downloaded for processing. The objective of this project is to investigate the usefulness of the Nearmap data for such applications as change detection and to use the API to display results in a web environment. The student will need some experience of programming in Javascript and one of Java/C+/C#. The project will be run jointly with A/Prof T. Tan of the Department of Computing at Curtin.

INVESTIGATION OF RELATIONSHIPS BETWEEN LIQUOR AVAILABILITY AND ROAD CRASHES

Supervisor: Cecilia Xia 207:332, tel. 9266 7563, c.xia@curtin.edu.au

Project Description:
Investigate if there appears to be a relationship between the licensed premises (by licence type) and alcohol-related motor vehicle crashes and pedestrian crashes (by severity, gender and time of day and day of the week) for the Statistical Sub-division of Vasse in the South West of Western Australia over a five year period.

INTERACTIVE SPATIAL ACTIVITY FOR HIGH-SCHOOL STUDENTS

Supervisor: Ms Elizabeth-Kate Gulland, Room: 207-226, Phone: 9266 3775, E.Gulland@curtin.edu.au

Project Description:
There is currently a skills shortage in the spatial sciences. This is influenced by a lack of awareness of the field amongst school students, the potential next generation of spatial scientists. Curtin University is involved in a number of outreach activities to school students. This project will develop an engrossing spatial activity for school students in one of three age brackets: 12-13, 14-15 or 16-17 years. The activity must be able to be completed by the target age group within a set time – either 30, 45, or 60 minutes. An interactive tool that can be used by individual or small groups of students must be produced. This can be for use in a computer laboratory or in the field using portable device(s) such as a GPS receiver, iPhone and/or Android phone. This project will involve some research into pedagogy (teaching & learning theory) and available technologies. Programming skills will be required.

INVESTIGATION OF AGENT-BASED MODELLING TECHNIQUES

Supervisor: Prof Bert Veenendaal, Phone: 9266 7565, B.Veenendaal@curtin.edu.au
Level: honours

Project Description:
The digital earth platforms and technologies are developing from viewing-oriented to process-oriented, with increasing capabilities for analysis, modelling and simulation. Agent-based modelling (ABM) is a powerful geocomputational technique that can be used to support geospatial modelling and simulation. This project investigates the ABM modelling tools available and does a comparative study in relation to a range of different geospatial applications.

LOCAL GOVERNMENT AREA FINDER MASHUP

Supervisor: Prof Bert Veenendaal, Phone: 9266 7565, B.Veenendaal@curtin.edu.au
Level: undergraduate

Project Description:
Develop a Google Maps mashup that finds Australian local government areas (LGAs) and other admin boundaries or point locations. Enhance the mashup with some thematic mapping of attributes over LGAs. Investigate the capability of mashups in integrating geospatial data from multiple sources.

Reference:

1. ProgrammableWeb 2012, 'Australian Postcode Finder', ProgrammableWeb.com. < http://www.programmableweb.com/mashup/australian-postcode-finder>

PLANNING WALKING TRAILS ACROSS MULTI-TENURE REGIONS

Supervisor: Prof Geoff West, Room: 207-302A, Phone: 9266 4695,G.West@curtin.edu.au
Elizabeth-Kate Gulland, Room: 207-227; Phone 9266 3775, E.Gulland@curtin.edu.au

Project Description:
This project contributes directly to a live research project run by the Curtin Centre for Sport and Recreation Research (CSRR). Seemingly straight-forward tasks in management of recreation resources can become very complex due to the number of people and organisations involved. This project focuses on the creation of a new walking trail through a region with overlapping management regimes and multiple tenures administered by various government departments and private land holders. The aim of this project is to produce a stand-alone, offline, interactive computer tool to facilitate workshop discussion between stakeholders regarding the best route for the trail while also resolving conflicting management agendas. To encourage discussion without the influence of vested interests, a simulated (fictionalised) environment must be developed. This project will coordinate with the CSRR and the WA Department of Sports and Recreation.

Reference:

1. CSRR website: http://research.humanities.curtin.edu.au/centres/csrr/

PRIMARY SCHOOL CARTOGRAPHY

Supervisor: Mike Tassell: 207:335, tel. 9266 7601, M.Tasselll@curtin.edu.au

Project Description:
The study should examine the map-reading skills of primary school students at different age-groups, and consequently the design of map symbols relevant to their perception levels. A case study at a local primary school is required with relevant testing of the selected symbols. Included in the symbol recognition should be an examination of the students' colour preferences. The creation of map-reading puzzles to stimulate an interest in mapping concepts would be a worthwhile exercise in the evaluation.

QUANTIFYING CARBON WITHIN NATURE RESERVES

Supervisor: Dr Tom Schut, Room 207-331, Phone: 9266 2691, t.schut@curtin.edu.au

Project Description:
Means to accurately quantify carbon stored within vegetation on a landscape scale is essential for carbon emission trading. Currently, it is unknown how much carbon is stored within native reserves in WA, particularly in trees. LiDAR is a promising means providing metrics that correlate well with the amounts of above-ground carbon (AGC). To measure the AGC, published allometric relationships based on trunk diameter and/or height will be used to estimate carbon in individual trees. In this project, suitability of selected metrics derived from LiDAR will be evaluated as predictor of AGC for a selected set of native tree species, and used as means to quantify the AGC in Boyagin Nature Reserve.

Reference:
2. M. Blades, S. Sowden and C. Spencer (1995), "Young Children's Use of Spatial Relationships in Tasks with Maps and Models", *Cartographica*, *Vol. 32, No. 1, Spring, 1995.*

SOIL EROSION SCAR DETECTION

Supervisor: Dr Tom Schut, Room 207-331, Phone: 9266 2691, t.schut@curtin.edu.au

Project Description:
Wind erosion is a very serious issue in Australia and other dry areas of the world. It removes valuable topsoil filled with nutrients and can cause eutrophication (i.e. fertilisation) of pristine environments, disturbing unique habitats and depleting one of the most valuable resources required for food production. The Department of Agriculture and Food WA (DAFWA) needs information on location of erosion scars and erosion susceptibility. A new method is developed based on a combination of spectral unmixing and object-orientated classification techniques that may be able to quantify susceptibility of erosion and detection of erosion scars for the northern agricultural zone of the south-west land division. This method needs to be tested, refined and validated for the years 2002-2010. Drive-by observations of soil coverage (good cover means low erosion risk) and geo-referenced airborne photography are available. Within this project, you will use data from and collaborate with experts of DAFWA.

SPATIAL ANALYSIS OF PLANT EVOLUTION ON SOUTH AFRICAN COASTAL PLANE

Supervisor: Dr Tom Schut, Room 207-331, Phone: 9266 2691, t.schut@curtin.edu.au

Project Description:
The coastal plains of South Africa went through periodic expansion and contraction, isolating populations of plant and animals, driving specification. It is hypothesised that that sea level fluctuations in this area contributed to the evolution of humans (Compton, 2011).

Spatial patterns of inundation and frequency of inundation can be used to derive measures of isolation of plant populations. It is hypothesised that population isolation can be directly linked to observed genetic and species diversity of the succulent, salt tolerant plants of the genus *Sarcocornia.* To test this hypothesis,

spatial datasets need to be prepared and analysed on spatial patterns linked to population isolation. As second step, these spatial pattern measures can then be used to better understand the role of isolation in evolution of *Sarcocornia*. This project is in collaboration with Prof. Laco Mucina from Curtin.

References

Compton, J.S., In Press. Pleistocene sea-level fluctuations and human evolution on the southern coastal plain of South Africa. Quaternary Science Reviews, doi: 10.1016/j.quascirev.2010.12.012.

SPATIAL EVALUATION OF ECOSYSTEM SERVICES

Supervisor: Robert Corner: 207:227, tel. 9266 7605, R.Corner@curtin.edu.au

Project Description:
The value of non-traded ecosystem services globally has been *estimated* at US$ 33trillion pa. GIS and Remote Sensing may be valuable tools in quantifying ecosystem services on a more local level. This project will investigate their use in this context.

SPATIO-TEMPORAL ANALYSIS OF PERTH'S FUEL PRICES

Supervisors: Michael Kuhn: 207:225, tel. 9266 7603, M.Kuhn@curtin.edu.au
Rob Corner: 207:227, tel. 9266 7605, R.Corner@curtin.edu.au

Project Description:
Since January 2001 FuelWatch (http://www.fuelwatch.wa.gov.au/) monitors the daily petrol prices at all petrol stations in Western Australia. In this project petrol prices available for the Perth metropolitan area over almost one decade should be analysed regarding the spatial and temporal variability. This should be done by employing the statistically-based Principal Component Analysis (software is available, e.g. R-Project statistical software http://www.r-project.org/ or FORTRAN77 software code) commonly used in geosciences applications such as in meteorology and oceanography.
Resources: Software for PCA and statistical analysis

SPECTRAL CHARACTERISTICS OF EROSION – LITERATURE REVIEW

Supervisor: Dr Jon Kirby: 207:207, tel. 9266 7701, j.kirby@curtin.edu.au

Project Description:
When topography is eroded by the action of water or wind, how does this change its spectral properties? That is, does erosion act to reduce the large-scale topographic features, the smaller features or does it reduce the amplitude of all features equally at all scales? In this project, you will search for and summarise existing literature in peer-reviewed journals, and perhaps draw your own conclusions.

TACTILE MAPPING – WHERE TO NOW?

Supervisor: Mike Tassell: 207:335, tel. 9266 7601, M.Tasselll@curtin.edu.au

Project Description:
The difficulties of the blind and visually impaired in 'reading' maps are to be discussed and the techniques employed to its solution are to be shown. It is required to examine the design and production of tactile maps, the latest technologies used as well as past practises in order to compare the advances made. In particular, a 'look' into the future to demonstrate what aids await; for example 'talking tablets' and 'audio GPS'. Education in the maps' interpretations should be part of this discussion.

Reference:

1. CSUN, Center On Disabilities (2003), "Accessible GPS for the Blind: What are the current and future frontiers?" Http:/www.csun.edu/cod/conf/2003/proceedings/140.htm

TEACHING TOOL FOR SPATIAL SCIENCES

Supervisor: Ms Elizabeth-Kate Gulland, Room: 207-226, Phone: 9266 3775, E.Gulland@curtin.edu.au

Project Description:
University students of spatial sciences must learn how to understand and apply a wide range of skills and concepts. This project will focus on a specific aspect, or a small group of related aspects, of spatial science and develop an interactive tool to demonstrate this to university students. The tool must be embedded within a webpage or pages giving background explanation of the concept. The focus topic may be taken from coordinate systems, spatial analysis, projection techniques, error calculation, visual representation of complex data, or another spatial concept chosen after discussion with the project supervisor. Example technologies for the tool may include HTML, Flash, iPhone/Android app, Google Earth and/or GIS or web mapping software. Programming and web programming skills will be required.

TREE SPECIES MAPPING USING LiDAR AND WORLDVIEW II IMAGERY

Supervisor: Dr Tom Schut, Room 207-331, Phone: 9266 2691, t.schut@curtin.edu.au

Project Description:
Mapping tree taxonomy up to family or species level is important for management of biodiversity and estimation of carbon storage. LiDAR can quantify canopy structural attributes, and is recently used to map vegetation types. However, it does not contain detailed spectral information. Worldview II is one of the most advanced high resolution imaging systems available. In this project, these two powerful datasets will be combined and evaluated on discriminating ability of iconic WA tree species. You will explore the potential to accurately map tree species within Boyagin nature reserve.

USE OF SOCIAL DATA SOURCES TO DRIVE RECREATION RESOURCE MANAGEMENT

Supervisor: Prof Geoff West, Room: 207-302A, Phone: 9266 4695, G.West@curtin.edu.au
Elizabeth-Kate Gulland, Room: 207-227; Phone 9266 3775, E.Gulland@curtin.edu.au

Project Description:
The WA Department of Sport and Recreation (DSR) and the Curtin Centre for Sport and Recreation Research (CSRR) are interested in finding areas of heavy use of recreational facilities to inform maintenance and access decisions. In this project, the viability of various social and involuntary data sources (e.g. Twitter, mobile phone networks, online GPS tracks) will be investigated for their usefulness in this field. Data from the chosen source/s will be collected, clustered and analysed and a programming tool or tools such as a web crawling script will be developed. One recreational activity (e.g. mountain biking, bushwalking, jet skiing, kite-surfing) will be selected to test the analysis and tool.

References:

1. CSRR website: http://research.humanities.curtin.edu.au/centres/csrr/
2. Twitter API FAQ: https://dev.twitter.com/docs/api-faq

VISUALISATION OF TOURISM IMPACT FOR THE NINGALOO REGION USING GOOGLE EARTH, GOOGLE MAPS AND OTHER TECHNIQUES

Supervisor: Prof Geoff West, Room: 207-302a, Phone: 9266 4695, g.west@curtin.edu.au

Project Description:
Humanities is mathematically modelling the characteristics of tourism and the impact of tourism planning decisions for the Ningaloo region of Western Australia. The output takes the form of graphs and tables showing temporal changes. The objective is to take the various scenarios produced and determine suitable animations of the data, and display results and trends. Currently this uses Google Earth but there are other visualisation engines that need to be investigated including Google Maps, Microsoft Bing and others. Note there is scope in this project for two students.