



Australian Government

CPPSIS6037 Conduct advanced remote sensing analysis

Release: 1

CPPSIS6037 Conduct advanced remote sensing analysis

Modification History

Release 1.

Replaces superseded equivalent CPPSIS6037A Conduct advanced remote sensing analysis.

This version first released with CPP Property Services Training Package Version 3.

Application

This unit of competency specifies the outcomes required to use computing platforms, software systems and image processing techniques to conduct advanced remote sensing analysis on hard copy and digital imagery. The unit covers preparing for work by analysing specifications and deciding appropriate techniques for collecting and analysing images, as well as appropriate hardware and software and image processing systems to perform the required image enhancements and manipulations. The unit also covers accessing and assessing available and suitable spatial datasets to identify constraints on use. The unit requires the ability to perform supervised and unsupervised classifications on datasets using classification algorithms, and to conduct related error analysis. It also requires the ability to merge remote sensing data and prepare data for geographic information system (GIS) integration.

The unit supports those who work in a technical management role in a spatial information services team, in areas such as cartography, town planning, mapping and GIS.

No licensing, legislative, regulatory, or certification requirements apply to this unit of competency at the time of endorsement.

Pre-requisite Unit

Nil

Unit Sector

Surveying and spatial information services

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the range of conditions.
1. Determine image processing techniques.	1.1. Project specifications are identified and analysed to determine appropriate image, merger and modelling techniques according to organisational requirements.

- 1.2. Appropriate data collection and analysis techniques in remote sensing process are determined according to project specifications.
 - 1.3. Suitable digital image processing techniques and digital image data formats are selected according to project specifications.
 - 1.4. Additional characteristics of image and **metadata** are identified according to project specifications.
2. Select computing platforms and software systems for image processing.
 - 2.1. Appropriate computing platforms and software systems are assessed for suitability according to project specifications.
 - 2.2. Availability of suitable data is verified with potential suppliers according to project specifications.
 - 2.3. Constraints on use of spatial data are assessed against project specifications and contingencies are planned according to organisational requirements.
 - 2.4. Commercially available image processing systems are assessed to determine appropriate components, menu items, **characteristics and statistics** to meet project specifications.
3. Enhance and manipulate images.
 - 3.1. Transformation routines using **image calculations** are conducted.
 - 3.2. Edge enhancements and smoothing filters are applied using convolution matrices.
 - 3.3. Image transformation is performed with channels of brightness, greenness and wetness.
 - 3.4. Imagery for distribution is determined according to project specifications.
4. Perform classifications on datasets.
 - 4.1. Thematic classifications and relative differentiations between supervised and unsupervised classification algorithms are determined.

- 4.2. Supervised classification algorithms are applied using training samples according to project specifications.
- 4.3. Error analysis is conducted to perform an approximate accuracy assessment of classifications.
- 4.4. Hard copy outputs are produced according to project specifications.
- 5. Conduct data merger and GIS integration.
 - 5.1. Integration and merging techniques are identified and documented.
 - 5.2. ***Techniques for integrating GIS data*** are identified and documented.
 - 5.3. Remote sensing data is merged and integrated into GIS according to project specifications.

Foundation Skills

This section describes the language, literacy, numeracy and employment skills essential to performance in this unit but not explicit in the performance criteria.

Skill	Performance feature
Learning skills to:	conduct research to source spatial data.
Planning and organising skills to:	plan and prioritise activities to meet contractual requirements.
Numeracy skills to:	- analyse points, lines, curves and shapes in vector graphics - apply and interpret algorithms to correctly classify images.
Oral communication skills to:	liaise with clients and end users to identify remote sensing requirements.
Reading skills to:	interpret graphical information in raster images.

- Technology skills to:
- use computers and software applications to manipulate and enhance images
 - use printers and plotters to produce hard copy outputs.
- Problem-solving skills to:
- apply solutions to identified classification discrepancies.

Range of Conditions

This section specifies work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included. Bold italicised wording, if used in the performance criteria, is detailed below.

- Metadata*** must include at least eight of the following:
- availability
 - conditions of use
 - coordinate system
 - currency
 - custodian
 - data accuracy
 - data description
 - date of acquisition
 - licence
 - quality
 - source
 - spatial data acquisition methodologies
 - version control.

- Characteristics and statistics*** must include at least two of the following:
- band selections
 - hard copy outputs
 - histogram plots
 - look-up tables
 - univariate and multivariate statistics.

- Image calculations*** must include at least one of the following:
- greenness ratios
 - greenness ratios plus dark value
 - normalised difference vegetation index (NDVI).

Techniques for integrating GIS data must include at least one of the following:

- cartographic modelling
- environmental modelling
- land cover classification.

Unit Mapping Information

CPPSIS6037A Conduct advanced remote sensing analysis

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=6f3f9672-30e8-4835-b348-205dfcf13d9b>

Assessment Requirements for CPPSIS6037 Conduct advanced remote sensing analysis

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Performance Evidence

A person demonstrating competency in this unit must satisfy the requirements of the elements, performance criteria, foundation skills and range of conditions of this unit. The person must also use a computer and remote sensing software system to conduct advanced remote sensing analysis for two different projects.

While conducting the above advanced remote sensing analysis, the person must:

- analyse and define job specifications, constraints and main work activities
- analyse remote sensing data to identify and describe its characteristics, including:
 - metadata
 - soil
 - vegetation bodies
 - water
- select and set up appropriate hardware and software systems to meet remote sensing project specifications
- assess commercially available image processing systems to ensure their suitability in meeting project specifications
- use remote sensing techniques to acquire spatial data from:
 - airborne platforms
 - ground observation
 - satellites
- comply with organisational and legal requirements for accessing and using spatial data, including copyright, intellectual property and trade practices
- comply with organisational requirements and industry-accepted standards relating to:
 - applying classification algorithms
 - quality and risk management
 - working safely when using above equipment
- conduct web-based searches to identify available spatial data and verify its suitability to meet project specifications
- exercise precision and accuracy when analysing and classifying remote sensing data
- identify and assess constraints relating to use of remote sensing data

- perform classifications on datasets using supervised and unsupervised classification algorithms and training samples
- save digital images in a range of formats, including two of the following:
 - band interleaved by line (BIL)
 - band interleaved by pixel (BIP)
 - band sequential (BSQ)
 - run length encoding (RLE)
- use integration and merging techniques to allow remote sensing data to be integrated into GIS
- use digital image processing techniques to enhance and rectify images.

Knowledge Evidence

A person demonstrating competency in this unit must demonstrate knowledge of:

- industry-accepted techniques for applying supervised and unsupervised classification algorithms to remote sensing data
- computer platforms and software systems for advanced remote sensing analysis and GIS integration
- copyright and ownership constraints relating to spatial data
- digital image processing techniques
- digital image data formats, including BIL, BIP, BSQ and RLE
- existing spatial datasets and dataset sources
- image calculations required for transformation routines, including:
 - greenness ratios
 - greenness ratios plus dark value
 - normalised difference vegetation index (NDVI)
- image enhancement, manipulation and merger techniques
- methods for analysing metadata
- methods for assessing commercially available image processing systems, including characteristics and statistics
- methods for validating spatial data sources and constraints on use
- key features of spatial referencing and coordinate systems
- techniques for integrating GIS data, including:
 - cartographic modelling
 - environmental modelling
 - land cover classification.

Assessment Conditions

The following must be present and available to learners during assessment activities:

- equipment:

- computer, including computer-aided design (CAD) applications and software appropriate for developing two-dimensional (2-D) and three-dimensional (3-D) terrain visualisations
- hardware, including printer, scanner, plotter and multimedia devices and peripherals
- specifications:
 - project and design specifications
 - organisational policies, procedures and documentation relating to data privacy and information copyright
- physical conditions:
 - access to equipped work station
- relationships with team members and supervisor:
 - lead role in a team
- relationships with client:
 - client consultation required.

Timeframe:

- as specified by client and project requirements.

Assessor requirements

As a minimum, assessors must satisfy the assessor requirements in the Standards for Registered Training Organisations (RTOs) current at the time of assessment.

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