

Title:/Titre:/Titel: A Diagnostic Strategy for Analyzing Residuals

Author (s)/Auteur (s)/Autor (en): James S. Bethel and Edward M. Mikhail

Abstract /Sommaire:/Zusammenfassung:

Some existing methods for detecting and locating gross observation errors in a least squares adjustment are reviewed. The mean shift outlier model is reviewed for the case of multiple outliers and a resulting test statistic is presented. The test statistic is based upon external studentization of a quadratic form of a candidate subset of the residuals. Critical values for this statistic are approximately obtained by Monte Carlo simulation and by the propagation of distributions. The strategy for the diagnostic method is then illustrated for two common photogrammetric least squares adjustment problems.

Title:/Titre:/Titel:

FORTRAN PROGRAMMING SYSTEM OF AREA ADJUSTMENT BY METHOD
OF INDEPENDENT MODELS

Author (s)/Auteur (s)/Autor (en):

Tang Bingxie

Abstract:/Sommaire:/Zusammenfassung:

In this programming system, inner geometry of central projection and data checked with abundant observation are sufficiently used so that its ability to detect primary data errors has been enhanced. Based on the fundamental principle of stereomodel coordinate transformation, the unified formulas are used to transform the photo-grammetric coordinate system, to splice the airstrips and to form the error equations of coordinate transform in independent model. Based on the principle of area adjustment by the use of independent model, the feature of band spare symmetric orthogonal matrix in solving normal equations, and the advantages of FORTRAN, in this programming system, the author has reduced the lines of program and the times of iteration for repeated adjustments, thus has shortened the duration of calculation. This programming system is divided into 6 blocks. Recently it has been performed on various computers(z-80, PDP11/23, PERKIN ELMER OS/32, M-150, etc.).

Title:/Titre:/Titel:

Remote Sensing and Information Systems



Author (s)/Auteur (s)/Autor (en):

A. Boud

Abstract:/Sommaire:/Zusammenfassung:

The knowledge industry is the most rapidly growing area of social production. Along with this, remote sensing has developed as an important data source for natural resource and environmental monitoring. The combination of both forms of data, remote sensing along with more conventional information sources, substantially increases the potential use of each.

Image processing technology can be used to improve: (a) geocoordinated data entry from maps; (b) image restoration; and (c) multispectral classification.

By combining and comparing the digital output of a geographical information system and digital remote sensing data, the remotely sensed data can: (a) be more accurately positioned; and (b) have more rigidly defined classification.

In this way, well registered remote sensing data can then be incorporated into a resource information system.

This is the start of a long-term and ambitious program at the University of Toronto to develop an expert system in resource management.

Title:/Titre:/Titel:

Pseudo-systematic deformations due to a simplified stochastic model.

Author (s)/Auteur (s)/Autor (en):

T. Bouloucos, ITC

Abstract:/Sommaire:/Zusammenfassung:

Systematic deformations are usually explained as being caused by a deficiency in the functional model.

An investigation is carried out, whether indeed deformations of a (pseudo)-systematic type are introduced by a deficiency in the stochastic model of the observations.

Title:/Titre:/Titel:

AERIAL TRIANGULATION IN PHOTOGRAMMETRIC, PLANIMETRIC
AND ALTIMETRIC MARK MEASUREMENTS TO BE USED IN LARGE SCALE
MAP COMPILATION, HAVING A 0,50m CONTOUR INTERVAL

Author (s)/Auteur (s)/Autor (en):

Mihai Burcea, dr. eng. Nicolae Neguț

Abstract:/Sommaire:/Zusammenfassung:

Some considerations related to strip and block developments, tie point and bench mark selections in the field, accuracies necessary in their measurements are presented.

The results presented are obtained during a 10 year period, using aerial triangulation as well as AERO 3 programmes in photogrammetric and planimetric mark measurements and also the recent results as regards the altimetric height mark measurements.

Title:/Titre:/Titel:

SELF-SMOOTHING OF DENSE DIGITAL ELEVATION MODELS

Author (s)/Auteur (s)/Autor (en):

M.A. Chapman

Abstract:/Sommaire:/Zusammenfassung:

The Gestalt Photo Mapper has proven itself to be one of the most reliable instruments in the class of automated photogrammetric equipment. Despite its ability to efficiently generate dense digital elevation models (DEM), small systematic errors can exist in the raw data.

Several novel methods which can be employed for smoothing and editing these DEM's are described. A comparison of the mathematical formulations, efficiency and results is given.

Title:/Titre:/Titel:

Utilization of Ancillary Information for Improvement of Digital
Multispectral Classification

Author (s)/Auteur (s)/Autor (en):

Elisabeth Dennert-Möller

Abstract:/Sommaire ,Zusammenfassung:

The quality of classification results depends on the information available to the classification system. Introduction of ancillary information - that means any kind of analogue or digital information, which directly or indirectly states anything about the classification problem - improves the separability of the classes.

In this paper two different methods of introducing ancillary information into the classification procedure are presented: the use of a priori probabilities and the addition of an artificial channel . Examples are given for both methods.

Title:/Titre:/Titel:

A Method of Generating Synthetic Multispectral Data

Author (s)/Auteur (s)/Autor (en):

Dr. S. L. Ekenobi

Abstract:/Sommaire:/Zusammenfassung:

The complexity of real multispectral digital data has been considered in this method. Random numbers were used since most real data have approximately the gaussian distribution, which infact most existing landuse classification algorithms assume. These synthetic data were used to study, among others, the influences of data variance and of the "threshold" (or reject) function on classification accuracy.

Title:/Titre:/Titel: DIGITAL RECTIFICATION OF MOMS (MODULAR OPTO-ELECTRONIC MULTISPECTRAL SCANNER) DATA

Author (s)/Auteur (s)/Autor (en):

R. Hössler, Munich Technical University

Abstract:/Sommaire:/Zusammenfassung:

First results from digital rectifications of linear array scanner data taken by the MOMS camera, developed by Messerschmitt Bölkow Blohm, Munich, are presented.

The data were obtained from an airplane platform in approximately 8000 m flying height. The image scale is about 1:33000. The restitution of the exterior orientation parameters is based on second order Gauss Markov processes. This method easily allows to consider control point information as well as recordings of the orientation parameters. For the resampling of the picture elements the direct method is used with consideration of a digital elevation model. The accuracy of the rectification is examined by photogrammetrically determined check points.

Title:/Titre:/Titel: Une chaîne de production automatique de cartes en relief à partir de photographies aériennes ou d'images numériques.

Author (s)/Auteur (s)/Autor (en): JANIN Benoît
(Institut géographique National-France)

Abstract:/Sommaire:/Zusammenfassung:

Une nouvelle application des Modèles Numériques de terrain, développée à l'Institut géographique national France, permet la production automatique sur une fraiseuse à commande numérique, de maquettes ou de cartes en relief à des échelles très variées.

L'auteur décrit les différents processus de calcul des M.N.T. selon la nature des données (semis aléatoire, courbes de niveau restituées ou images numériques), les systèmes de contrôle et de correction des M.N.T et le processus de fraisage.

Les données planimétriques issues de la restitution permettent en outre d'esquisser les éléments de la planimétrie pour l'habillage de la maquette.

Title:/Titre:/Titel: Creation et manipulation d'une base de données multi-sources .

Building , setting and managing a multi-source data base .

Author (s)/Auteur (s)/Autor (en):

Robert JEANSOULIN . Serge ABITEBOUL - Jean-Yves GARINET

Abstract:/Sommaire:/Zusammenfassung:

Les utilisateurs de la Teledetection manipulent un nombre de plus en plus important de données de sources diverses : cartes, images, relevés de terrain...

On va décrire les travaux développés au CNRS (Toulouse), à l'INRIA, au CNES et au Centre Scientifique IBM (Paris) sur les points suivants :

- Reconnaissance de la géométrie = repérage, recalage, correction géométrique, influence du relief
- Transformation des modes de représentation = analyse structurale (les formes de l'image sont cartographiées), synthèse (des courbes de niveau à l'image des pentes)
- Accès à l'information = relationnel (localisation géographique, date) ou fonctionnel (visu simultanée, superposition graphique ...)

Title:/Titre:/Titel:

RESULTS FROM APPLICATION OF AERIAL TRIANGULATION

Author (s)/Auteur (s)/Autor (en):

Ivan S. Katzarsky

Abstract:/Sommaire:/Zusammenfassung:

At the 14th ISPRS Congress, Hamburg, 1980, the autor presented a paper on technology for analytical aerial triangulation by block adjustment. In this presented paper, some practical results from the application of the same technology are submitted.

Title:/Titre:/Titel:

Vergleichende Aerotriangulation

Author (s)/Auteur (s)/Autor (en):

KÖLBL Otto

Abstract:/Sommaire:/Zusammenfassung:

Höchste Genauigkeitsanforderungen an die Aerotriangulation werden in der Schweiz bei der Grundbuchvermessung gestellt. In Gebirgsregionen mit zum Teil recht unregelmässigen Punktverteilungen lassen sich die heute üblichen Flugdispositionen nur sehr begrenzt anwenden; so würde die zum Teil nur sehr geringe Punktdichte Bildmassstäbe um 1:10'000 naheliegen, umgekehrt sollte der Bildmassstab grösser als 1:5000 gewählt werden da anderenfalls die Steinköpfe als Signale nicht mehr ausgemacht werden können. Zur Erarbeitung von Lösungsmöglichkeiten für diese recht widersprüchlichen Anforderungen wurde zunächst in der Umgebung von Lausanne ein Präzisionstestfeld aufgebaut. Neben Bildflügen mit Weitwinkelkammern im Massstab 1:5000 wurden Versuche mit Simultanüberdeckungen in den Massstäben 1:6000 und 1:3000 gemacht, wobei sich für die grossmassstäbigen Aufnahmen keine stereoskopische Überdeckung mehr ergibt. Ferner werden vergleichende Versuche mit Kamern verschiedener Fabrikanten einschliesslich von Kamern mit Kompensation der Bildwanderung unternommen. Schliesslich wird in der Arbeit versucht verschiedene Mess- und Ausgleichverfahren der Aerotriangulation zu vergleichen.

AERIALTRIANGULATION WITH WILD SYSTEMS

WALTER KREILING and FRANZ STEIDLER

WILD HEERBRUGG LTD.

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Switzerland

WILD offers in connection with its photogrammetric systems various possibilities for measuring and computing of aerialtriangulation. The observations can be gathered at the analytical systems AC1 or BC1, at the RAP system or any other analog instrument. For the Aviolyts and RAP several measuring programs exist, which provide many online checks. The programs available for aerialtriangulation are ATS, ATM, PAT-M, PAT-B, ATS is a low-cost program with polynomial adjustment based on strips. PAT-M and ATM are programs working with the method of independent models, PAT-B with bundles and self-calibration. PAT-M, ATM and PAT-B are written in FORTRAN and run on NOVA 4/X and VAX computers, ATS on RAP system. For reducing the computation time, a fully automatic bandwidth minimization algorithm is available for ATM, PAT-M and PAT-B. After the aerialtriangulation, a program ORIAN can be started, which computes the orientation parameters for several analog instruments and the AVIOLYT analytical plotters.

Title:/Titre:/Titel:

Metric Properties of Airborne Linescan
and Radar Images

Author (s)/Auteur (s)/Autor (en):

Zdzisław Kurczyński

Abstract:/Sommaire:/Zusammenfassung:

In this paper the metric evaluation of a single strips of line scan and side-looking radar imagery will be discussed. To ascertain the planimetric point accuracy attainable with a airborne remote sensing imagery following kind of strips were investigated:

- three strips of imagery produced by THP-1 infrared line scanner,
- two strips of multispectral line scanner C-500,
- fifteen strips produced by side-looking radar system TOROS.

The imageries were fitted to planimetric control points by four methods: parametric mathematical model, general polynomial transformation, moving averages, linear least squares interpolation. An analysis of influence of calibration methods, number and distribution of control points on accuracy of restitution will be carried out.

Title:/Titre:/Titel:

Fundamental tests and sensitivity studies with ACCSIM

Author (s)/Auteur (s)/Autor (en):

M.M. Radwan and J. Kure, ITC.

Abstract:/Sommaire:/Zusammenfassung:

This paper summarises the initial results obtained with ACCSIM, the program developed to establish the accuracy performance of aerial triangulations. The fundamental tests examine the effects of varying the point configurations (location, number and accuracy of relative orientation points and tie points), the terrain configurations (flat, sloping and hilly) and the flight configurations (forward and lateral overlap). The sensitivity studies include testing the propagation laws for individual errors and variances and examining the effects of systematic errors on both coordinate correlation and the generation pseudo-random errors in irregular configurations.

Title./Titre./Titel: Correlating Digitized Aerial Photographs to Satellite
MSS-Data to Measure Ground Control

by Jan Larsson

One of the necessary preprocessings in the analysis of digital satellite images is geometric rectification. The purpose of this project is to improve the accuracy in the geometric rectification of MSS-data (MSS = Multi Spectral Sensor) by introducing new methods for measuring image co-ordinates for ground control points (GCP).

Our approach is to introduce a digitized aerial photograph between the MSS-image and the ground.

One object (e.g. a cross road) in the aerial photograph is digitized (with high resolution) and its connection with the ground is calculated with pixel-pointing. The ground control points are determined with photogrammetry and not measured from a map, which will improve the accuracy of these points. After resampling to satellite pixel size the aerial photograph can be positioned in the satellite image using image correlation.

In a sub-image of 256 x 256 pixels of a LANDSAT-image 15 possible objects have been digitized.

Finally we will resample the satellite image, to calculate the accuracy of the method.

In the experiment three different algorithms of image correlations are evaluated.

In production one would need a library with digitized aerial photographs in order to cover the area with ground control. This could for example be done most efficiently using an analytical plotter with equipment for on-line digitizing of sub-images.

Title./Titre./Titel:

Digital Elevation Model computation using
fast Poisson solutions.

Author (s)/Auteur (s)/Autor (en):

Dr. Rune Larsson

Abstract./Sommaire./Zusammenfassung:

Fast Poisson solutions of the five point difference approximation to Poisson's equation on a rectangular structure are presented. It is shown that these methods can be applied to Digital Elevation Model computation given that some demands on regularity are filled. Using domain decomposition some of the demands can be eased and e.g. allow for progressive sampling methods. The possibility to further generalise these methods is discussed.

Title:/Titre:/Titel:

MATHEMATICAL PATTERN RECOGNITION AND IMAGE ANALYSIS
REPORT OF WORKING GROUP III/5

Author (s)/Auteur (s)/Autor (en):

F. LEBERL
Technical University and Graz Research Center

Abstract:/Sommaire:/Zusammenfassung:

Pattern Recognition is a concept of computer science that is useful in the analysis of digital images and therefore of great relevance to remote sensing and photogrammetry. The paper presents a review of recent developments in the field, in particular in connection with WG III/5. The core of activities was a specialist work-shop held on Pattern Recognition in Photogrammetry in 1983.

Title:/Titre:/Titel: *Partially Supervised Classification of
Segmented SAR and Multisensor imagery*

Author (s)/Auteur (s)/Autor (en):

W. Mehl, R. Ruppelt

Abstract:/Sommaire:/Zusammenfassung:

The local inhomogeneity of SAR imagery and the high dimensionality of multisensor imagery require that homogeneous objects are classified as single units, thus permitting to derive better defined statistical features and to reduce the number of items to be classified. A classification scheme for appropriately segmented imagery is presented which combines unsupervised aggregation with trained classification. Some approaches to image segmentation applicable also to SAR (or otherwise very noisy) imagery are discussed.

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Title:/Titre:/Titel:

Segmentation and line detection

Author (s)/Auteur (s)/Autor (en):

N. J. Mulder

Abstract:/Sommaire:/Zusammenfassung:

Segmentation is presented as a method of spatial / spectral clustering using repeatedly a nonlinear three by three operator.

Cluster criteria are user supplied or derived from local rank order statistics. Spatial criteria are user defined using a shape table. A special case of application of the shape table is discussed for line detection / enhancement.

Convergence ~~is~~ speed is estimated for various operator parameters in applications with radar data, mss data, digitized stereo-pairs and digital elevation data.

Title:/Titre:/Titel:

Estimation of the Accuracy in Digital Elevation Data Banks

Author (s)/Auteur (s)/Autor (en):

Anders Östman

Abstract:/Sommaire:/Zusammenfassung:

The accuracy in a digital elevation data bank is usually declared as the accuracy in stored elevations. The accuracy in elevations at points located between the stored elevations and the accuracy in functions of elevations are not functions of the accuracy in stored elevations only, but also functions of interpolation methods, the terrain undulations, the spacing between the stored points and the correlation between the errors in stored elevations.

This paper treats methods for the estimation of accuracies in digital elevation data banks. Fundamental formulas for error propagation and techniques for estimation of accuracy in functions of the elevations are given. The methods are compared by using the test material of the ISPRS-DEM test.

Title:/Titre:/Titel:

DIGITAL TERRAIN MODELS IN THE STUDY OF DRAINAGE

Author (s)/Auteur (s)/Autor (en):

Patmios E.

Abstract:/Sommaire:/Zusammenfassung:

This study concerns the direction of digital models' applications in order to get data relevant with technical work.

The methodology of digital terrain model is presented in combination with ground classification according to geomorphological units (landforms).

The study concerns Greece, where problems of torrents' are of particular interest.

Title:/Titre:/Titel:

Integration of Surveying Technologies Using Array Algebra

Author (s)/Auteur (s)/Autor (en):

Urho A. Rauhala

Abstract:/Sommaire:/Zusammenfassung:

The fast math of array algebra reported in the ISP Congresses since 1972, is shown to form the general algebraic foundation of digital signal processing. The applicability of the efficient operators of these sciences is then extended to general linear algebra by introduction of the philosophy of iterative array solutions; the inner loop employs the fast but restricted operators and signal processors while the outer loop accomodates the deviations of the problem from these restrictions. Applications of this new philosophy in the problems of array DTM, rectification, correlation, strip and block adjustments, inertial surveying and other positioning techniques has resulted in a new concept of an integrated, fully digital, surveying system. Its purely photogrammetric subsystem involving a cascade of new software and hardware innovations has impressive accuracy, cost and time aspects. It will cause a rethinking in the future point densification technologies of surveying sciences.

Title:/Titre:/Titel:

Computational and Numerical Considerations of Block Adjustment
in a Minicomputer of an Analytical Plotter

Author (s)/Auteur (s)/Autor (en):

Tapani Sarjakoski

Abstract:/Sommaire./Zusammenfassung:

Concerning the block adjustment program as a part of an on-line triangulation system there is a request for a flexible and fast execution of the adjustment program. On the other hand, the limited capacity of the minicomputer sets special demands for the program. The methods for storing and accessing the data effectively on random-access files are discussed. For timing purposes the solution process based on Gaussian elimination is carried out in single precision. Preconditioning and iterative refinement is used for reducing the problems arising from rounding errors. Timing examples of the program and the results of the numerical methods are reported.

Title:/Titre:/Titel:

Analysis of view-angle-dependent radiometric distortions
in aircraft remote sensing data
using least squares adjustment techniques

Author (s)/Auteur (s)/Autor (en):

Werner Schneider

Abstract:/Sommaire./Zusammenfassung:

View-angle-dependent radiometric distortions of aircraft multispectral remote sensing data act partly in a multiplicative way (transmission of optical system, transmission of atmosphere), partly in an additive way (atmospheric path radiance) and partly in a way that in general can be described neither by a multiplicative, nor by an additive term (object reflectance). This paper describes a method for analysing these radiometric distortions based on near-Lambertian natural sample areas of unknown reflectance, each of which is imaged at least twice in the overlapping regions of neighbouring images (scanner flight strips). Assuming polynomials for the image coordinate dependence of the multiplicative and the additive term, the coefficients of these polynomials are determined by least squares adjustment. Using radiometric reference measurements and/or image data acquired at different flight heights, it is possible to derive from these functions the transmission of the sensor optical system, the atmospheric transmission as well as the atmospheric path radiance.

Title:/Titre:/Titel:

Accuracy of a digital elevation model obtained by progressive sampling.

Author (s)/Auteur (s)/Autor (en):

K. Tempfli

Abstract:/Sommaire:/Zusammenfassung:

Progressive sampling of terrain relief results in an incomplete grid DEM. The grid density is locally adapted to the terrain variability. The progressive densification of the sampling grid is controlled by an on-line analysis of the already measured elevation values using as criterion a threshold for the second differences. For a given terrain relief the specified maximum number of densification runs, the grid spacing, and the threshold determine the achievable fidelity of the terrain representation. The concept of transfer function is utilized to describe the DEM fidelity. The accuracy estimation by transfer function and power spectrum of the terrain is tested with synthetic terrain data.

Title:/Titre:/Titel. Accuracy of Photogrammetric Digital Elevation Models

Kennert Torlegård, Stockholm, Sweden

A working group has conducted an international comparative test based on a resolution from the ISPRS Congress in Hamburg. The objective of the test was to study the relations between methods for data acquisition, interpolation, resulting accuracy and type of terrain.

Six test areas were selected, which have different topographic structures varying from smooth rolling farmland to very steep mountains with forest in the valleys. Nine organisations have produced DEMs from aerial photographs in scales 1:4 000 - 1:30 000. The DEMs have then been used for the derivation of elevations in a set of check points, the locations of which were unknown when the DEM was measured in the stereo instrument. The elevations of these check points were then compared with their "true" values.

The "true" errors found in the check points are presented and analysed. After elimination of blunders the remaining errors are composed of systematic and random parts. The systematic parts can originate from the reconstruction of the stereo model, from the interpolation of the DEM, and from effects of the vegetation height. The size and distribution of the "true" errors are presented in Tables, Diagrammes, and Illustrations. Errors of functions of the DEM (e.g. slope and curvature) are also studied.