GEODETIC LINEAR ESTIMATION THEORY – GED507

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Concepts of Observation and the Model
- Observations
- The Mathematical Model

Statistical Concepts
- Probability, Distribution and Density Functions
- Multidimensional Distributions, Marginal and Conditional Distributions, Independence
- Expectations, Moments, and Correlation
- Some often used Distributions
- Multinormal Distribution
- Sampling, Estimation, and Confidence Measures
- Statistical Tests

Error Properties
- Random Errors
- Precision, Accuracy, Cofactors, and Weights
- Blunders
- Systematic Effects (Errors)

Principle and Techniques of Propagation
- Propagation of Distributions
- Propagation of Means
- Propagation of Variances and Covariance
- Propagation of Systematic and “True” Errors

Introduction to Least Squares Adjustment
- The Least Square Principle
- The Techniques of Least Squares
- Linear an Nonlinear Functions in the Model

Adjustment with Conditions Only
- General Case
  - Derivations
  - Adjustment with Maximum Number of Independent Parameters
  - Geometric Interpretation of the Least Square Principle
- Special Cases
  - Adjustment of Observations Only
  - Adjustment of Indirect Observations

Examples and General Discussion on Adjustment with Conditions Only
- Coordinate Transformations
Least Squares Adjustment with Conditions and Constraints
  ➢ General Case for Adjustment with Conditions and Constraints
  ➢ Special Cases
  ➢ Constraints with Added Parameters

Adjustment with Derived Observations and Adjustment in Steps
  ➢ Adjustment with Derived Observations
  ➢ Adjustment in Steps

Numerical and Statistical Consideration in Adjustment
  ➢ Nonlinearity of the Equations
  ➢ Approximate Values for Model Variables
  ➢ A posteriori Estimate of the Reference Variance
  ➢ Iteration Termination with Linearized Conditions
  ➢ A Posteriori Statistical Analysis
  ➢ Computational and Numerical Considerations

Problems