

GENERAL INDEX

PROLOGUE	9
----------------	---

THE CONCEPTS OF GEODESY AND CARTOGRAPHY

CHAPTER 1: GEODESY.....	11
1. The concept of Geodesy.....	11
2. Branches of Geodesy.....	12
3. Divisions of Geodesy.....	13
4. Objectives of Geodesy.....	13
5. Physical Geodesy.....	16
6. Mathematical Geodesy.....	17
7. Relation between the Geoid and the Ellipsoid.....	20
CHAPTER 2: REFERENCE SYSTEMS.....	23
1. Reference Systems.....	23
2. Frames of Reference.....	24
3. Terrestrial Reference Systems.....	25
3.1. European Datum 1950 (ED50) reference system.....	25
3.2. European Terrestrial System (ETRS89).....	27
3.3. World Geodetic System 1984 (WGS84).....	28
4. Transformation between Reference Systems.....	29
4.1. Transformation WGS84-ED50.....	30
4.2. ED50-ETRS89 transformation.....	32
<i>a. Transformation of Isolated Points.....</i>	<i>33</i>
<i>b. Transformation of Vectorial Cartography.....</i>	<i>33</i>
<i>c. Transformation of Orthophotographs.....</i>	<i>35</i>
CHAPTER 3: CARTOGRAPHICAL PROJECTIONS. UTM.....	36
1. Cartographical projections.....	36
2. Types of Projection.....	36
3. UTM projection.....	38
3.1. Advantages of the UTM projection.....	39

3.2. UTM zones	40
3.3. UTM coordinates.....	41
3.4. Overlapping grids	42
3.5. Duplication of coordinates between the extremes of two consecutive UTM zones.....	44

APPLIED DIGITAL PHOTOGRAMMETRY

CHAPTER 1: INTRODUCTION TO PHOTOGRAMMETRY.

STEREOSCOPIIC VIEW.....	46
1. Photogrammetry.....	46
2. Fundamental elements of Photogrammetry	47
3. Basic principle of Photogrammetry	49
4. Stereoscopic view. Parallax.....	50
4.1. Procedures for artificial stereoscopic view	51
4.2. Stereoscopic parallax	53
5. Classification of Photogrammetry	55
6. Advantages and disadvantages of Photogrammetry in relation to Classical Surveying.....	57
7. Photogrammetry applications for Civil Engineering	57

CHAPTER 2: DIGITAL PHOTOGRAMMETRIC IMAGE

1. Background.....	58
2. Digital image.....	58
2.1. Characteristics of digital images	59
<i>a. Resolution.</i>	59
<i>b. Dimension.</i>	60
<i>c. Colour depth</i>	60
2.2. File size	61
3. Image compression	61
3.1. Discrete cosine transformation (DCT).....	63
3.2. Lempel Ziv Welch (LZW)	64
3.3. Discrete Walavet transformation (DWT).....	64
4. Pyramid of images.....	65
5. Graphic formats of digital photogrammetric images.	66
6. Digital treatment of images	66
6.1. Histogram of an image	67

6.2. Image enhancement techniques.....	68
6.3. Filters.....	69
<i>a. Smoothing and low pass filters</i>	69
<i>b. Enhancing and high pass filters</i>	69
6.4. Types of enhancements allowed in photogrammetry.....	70
CHAPTER 3: PHOTOGRAMMETRIC CAMERAS.....	72
1. Introduction.....	72
2. Photogrammetric analogical cameras.....	72
2.1. Components of analogical cameras.....	72
3. Digital cameras.....	75
3.1. Linear cameras.....	75
3.1. Matrix cameras.....	77
4. Comparison between both cameras.....	78
CHAPTER 4: PHOTOGRAMMETRIC PROCESS.....	80
1. Background.....	80
2. Introduction.....	80
3. Digital photogrammetric process.....	80
3.1. Interior orientation.....	81
<i>a. Interior orientation with analogical cameras</i>	84
<i>b. Interior orientation with digital cameras</i>	86
3.2. Relative orientation.....	87
3.3. Absolute orientation.....	90
<i>a. Ground control points</i>	90
3.4. Exterior orientation (relative and absolute in one step).....	93
3.5. Aerotriangulation.....	94
<i>a. Distribution and number of ground control points</i>	95
4. Allowable errors in the digital photogrammetric process.....	96
5. Position quality control of the digital photogrammetric process.....	98
6. Photogrammetric restitution.....	99
CHAPTER 5: PHOTOGRAMMETRIC PRODUCTS.....	101
1. Introduction.....	101
2. Vector maps obtained from restitution.....	101
2.1. Restitution's quality.....	103
3. Digital elevation models.....	104
3.1. DEM data structure.....	105
3.2. DEM generation methods.....	106

4. Orthophotographs	110
4.1. Image rectification	110
4.2. Orthoprojection	110
5. Types of orthophotographs	112
6. Orthophotographs mosaic	115
7. Orthophotographs quality	117
CHAPTER 6: FLIGHT PROJECT. TECHNICAL SPECIFICATIONS.	119
1. Introduction	119
2. Photogrammetric technical specifications	119
2.1. General Conditions	119
2.2. Flight conditions	120
2.3. Ground control surveying conditions	121
2.4. Restitution and cartography conditions	121
2.5. DEM and orthophotographs conditions	122
3. Flight planning	123
3.1. Initial data	124
3.2. Flight characteristics' calculation	124
CHAPTER 7: FUTURE OF PHOTOGRAMMETRY; LIDAR AND SPACE PHOTOGRAMMETRY	129
1. LiDAR	129
1.1. Advantages and disadvantages of LiDAR	131
1.2. Technological applications of LiDAR	132
2. Space photogrammetry	134
2.1. Types of Stereoscopic geometry	134
Stereoscopic satellites	136
BIBLIOGRAPHY	137