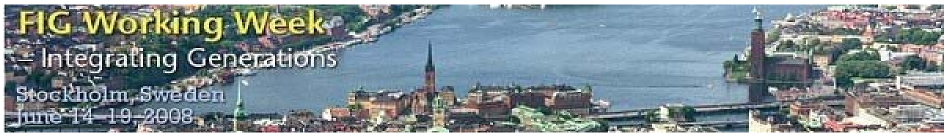

Use of Quick Bird Panchromatic Image and GPS Navigation

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INTRODUCTION

The cadastral systems at Brazilian city halls have been practically abandoned, with many errors and without any maintenance policy. Cartography is the main instrument of support for the cadastral systems. Only in recent years has it been considered as an important means to supply graphic information to the planning activity, becoming useful in the decision making process.

INTRODUCTION

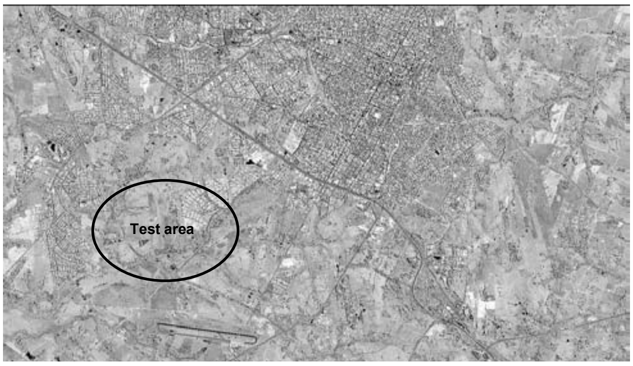
In this work, the Quick Bird images and the GPS navigation receiver were used for cadastral survey, mainly of real estate characterized physically by irregular polygons, which are difficult to be measured using simple topographic methods such as tape-measure measurement. In this method, the GPS navigation is used for the survey of control and check points, which will be used in image orthoretification and quality control processes. This way, the image is orthoretified to obtain the vertexes coordinates for properties of interest.

DEVELOPMENT

The software used records raw data received from navigation receivers, the observables: pseudorange and L_1 carrier phase, and transform them in RINEX format, was developed at the Polytechnic University of Madrid, in Spain, are designated as ASYNC and GAR2RNX (*Garmin to Rinex*) (GALAN, 2002).

DEVELOPMENT

The next procedure was carrying out the image geometric correction using the Rational Function Model, a digital terrain model and the referred control points, using Leica Photogrammetric Suite (LPS) software.



EXPERIMENTS AND RESULTS

The figure shows the generated orthoimage, in which some properties with rural characteristics were surveyed, in their majority, some being used as country recreation areas or residences.

EXPERIMENTS AND RESULTS

The table shows the discrepancies of the coordinates determined through a GPS navigation receiver and those determined from the orthoimage.

Point	ΔE(m)	ΔN(m)
P1	0.305	-0.089
P2	0.047	1.117
P3	0.776	0.562
P4	-0.277	-1.174
P5	0.034	-0.623
P6	0.270	-0.002
P7	-0.868	0.383
P8	-0.551	-0.705
P9	-0.131	0.335
P10	0.285	-0.549
P12	-0.619	-0.517
P13	0.432	-0.534
P14	0.554	-0.593
P15	0.601	0.587
P16	0.040	-0.498
P17	-0.045	-0.620
P18	-0.211	-0.581
P19	-0.546	-0.047
P20	-0.286	-0.537
P22	0.543	0.543
P24	-0.571	-0.580
P25	-0.602	0.525
Average	-0.021	-0.163
Standard deviation	0.486	0.586

EXPERIMENTS AND RESULTS

Table 4-2: Area and perimeter: discrepancies for the PR8 and PR7 properties, with relation of data obtained with the GPS navigation receiver.

		Property PR8	Property PR7
Points/GPS Garmin 12XL post-processing	Area	70526.133 m^2	72382.804 m^2
	Perimeter	1335.654 m	1355.416 m
QuickBird Image Orthorectified	Area	A1=70734.416 A2=70739.728 A3=70460.769 $A_{average}$ = 70644.971 m^2	A1=72461.565 A2=72520.170 A3=72475.464 $A_{average}$ = 72485.733 m^2
	Perimeter	P1=1339.037 P2=1337.504 P3= 1337.850 $P_{average}$ = 1338.13 m	P1=1355.673 P2=1354.104 P3=1356.062 $P_{average}$ =1355.279m
Discrepancy	Area	D =118.838 m^2	D =102.929 m^2
	Perimeter	D = 2.476 m	D = 0.137 m

Observing the table, it can be observed that the discrepancies found between the areas obtained through GPS navigation and through orthoimage were around 100 m^2 for the real estates PR8 and PR7, representing just 0.16% and 0.14% of the areas, respectively. Perimeter: 0.18%.

EXPERIMENTS AND RESULTS

Table 4-3: Area and perimeter: discrepancies for the PR8 and PR7 properties, with relation of data obtained with the GPS Geodetic receiver.

		Property PR8	Property PR7
Points/GPS Trimble 4600LS	Area	70878.054 m^2	72261.3022 m^2
	Perimeter	1336.824m	1354.904m
QuickBird Image Orthorectified	Area	$A_{average}$ = 70644.971 m^2	$A_{average}$ = 72485.733 m^2
	Perimeter	$P_{average}$ = 1338.13 m	$P_{average}$ = 1355.279m
Discrepancy	Area	D = 233.083 m^2	D = 244.431 m^2
	Perimeter	D = 1.314m	D = 0.375m

Observing the table, it can be observed that the discrepancies found between the areas obtained through GPS geodetic and the same ones through orthoimage were around 240 m^2 for the PR8 and PR7 properties, representing a difference of approximately 0.33% and 0.34%, respectively. As to the perimeter the difference was better than 1.314 m, which corresponds to an error around 0.098%.

CONCLUSIONS

It can be observed that this methodology allows for a significant improvement of quality of cadastral surveying of real estate with specific physical characteristics such as irregular polygons existing in the known urban empty areas and the urban expansion areas (Urban Glebes).

Considering that the coordinates obtained through the GPS geodetic has a lower positional error than the error found in the determinations with the GPS navigation with the post-processed observables, these results are more significant.

It should be pointed out that the Brazilian Civil Code, in its Article 500 § 1º, established the maximum of one twentieth in the total area of the real estate to be commercialized, or in other words, 5% in a time that the topographic surveying methods did not have the resources that are available today.

The conditions in which the images are found, practically nadiral, with just 3º of inclination, as well as the relief is not predominant steep in the study areas, contributed significantly to the positive results obtained in this work, due the favorable conditions that cannot always be achieved.

However, it is recommended to carry out future studies in less favorable conditions for the comparison of these results with those obtained until now.

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Thank you for your attention!

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