The Most Suitable Sizes Of Ground Control Points (Gcps) For World View2

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SUMMARY

Great developments have been obtained regarding the satellite images in parellel with the technoligical improvements and these efforts are going on. Nowadays, it is possible to obtain satellite images under 50 cm resolution. High Resolution Satellite Images (HRSI) have been indispensable data source for private and govermental sectors. Because, they are up to date, digital, and there is no restriction in view of the legality. The demand for the HRSI has been increasing day by day. One of the most important use areas of HRSI is mapping sector. In this sector, updating existing maps, and producing the middle and big scaled maps have been accomplished. Spatial accuracy is very important in producing maps and updating existing maps. To obtained maps from HRSI or use HRSI as map, the satellite images requires certain rectification. For a rectification process, ground control points (GCPs) are marked in field, whose coordinates are known in both land and image. The selection of GCPs for remote sensing image rectification is an important step. In this study, ground control points (GCPs) have been set up in the field at difference sizes.The most suitable size of ground control point has been investigated at HRSI (World view 2, 0.5 m resolution)

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1 INTRODUCTION

High resolution satellite images, (less than 1 m. Resolution) are used in many fields. For example, updating existing maps, land use mapping, urban planning, disaster monitoring, and so on. To use high resolution satellite images in such fields, they have to be rectified. Rectification process is done by points, whose coordinates are known in both land and image. The selected points may indicate either measured points in the field or/and can be designated as visible points in images. These points may represent; building corner, road cross, painting objects, etc. Points which are set up in the field are either acquired from existing maps or from image matching the research site. The main purpose of the present study is to identify the most suitable size of the field points, which might be marked in land by using ground control points for rectification.

2 IMPORTANCE OF CONTROL POINTS

Acquisition of ground control points (GCPs) is particularly important for geometric correction of high resolution satellite images. The commercial high resolution satellite image can be accurately rectified using the combination of bias-corrected rational polynomial coefficients (RPCs) and ground control points (GCPs).. However, the accuracy of the results is dependent on the precision of the GCPs [1].

The control points could be acquired by three different methods for geometric correction in two and three dimensional of high resolution satellite images. These are; GCPs from existing maps, GCPs set up in land, GCPs from image matching. [2] used above mentioned methods in acquisition of GCPs for geometric correction of high resolution satellite image. They achieved the best result with surveyed GCPs. If we select or use big sized GCP, it is difficult to find the centre of the point on the image.If we select or use small sized GCP in this time, we cannot see the point on the image [3].

3 WORLVIEW-2

WorldView-2, launched October 2009, is the first high-resolution 8-band multispectral commercial satellite. Operating at an altitude of 770 kilometers, WorldView-2 provides 46 cm* panchromatic resolution and 1.84 meter* multispectral resolution. WorldView-2 has an average revisit time of 1.1 days and is capable of collecting up to 975,000 square kilometers (376,000 square miles) per day**, more than tripling the DigitalGlobe multispectral collection capacity for more rapid and reliable collection.

The WorldView-2 system, offering incredible accuracy, agility, capacity and spectral diversity, allows DigitalGlobe to substantially expand its imagery product offerings to both commercial and government customers.

* Distribution and use of imagery at better than .50 m GSD pan and 2.0 m GSD multispectral is subject to prior approval by the U.S. Government.
** Panchromatic collection [4]

4 TEST AREA , OFFICE AND FIELD STUDY

4.1 Test area

14*14 km2 test field has been selected for study in the Konya -TURKEY. Selected areas consist of setlement areas, university, mountain and flat fields. There are no trees on the test field.The heihgt differences are about between 1000 and 1500m**.**

Acquisition date of WorldView2 stereo image is 7 sebtember 2011 (Figure 4.1.1)

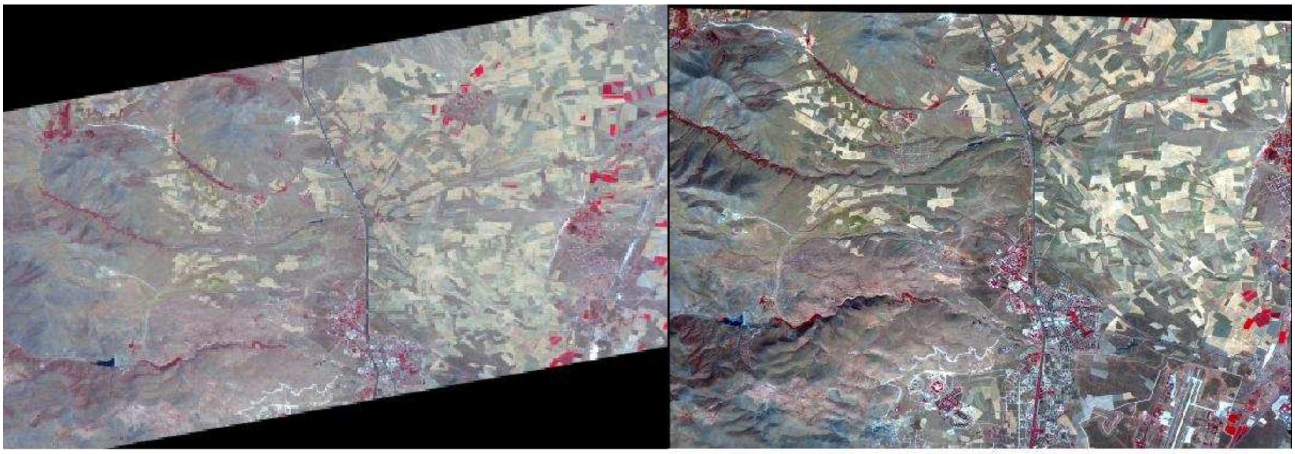

Figure 4.1.1: Stereo image

4.2 Office and Field studies

First of all; location of GCPs have been selected on the 1/25000 scaled map. Nonresidental places have been selected for GCP. The aim of this is prevent of GCP from the destroying and ,secondly to use for other different studies. Steel Frame with measurements given has been made for the GCP, (Figure 4.2.1)

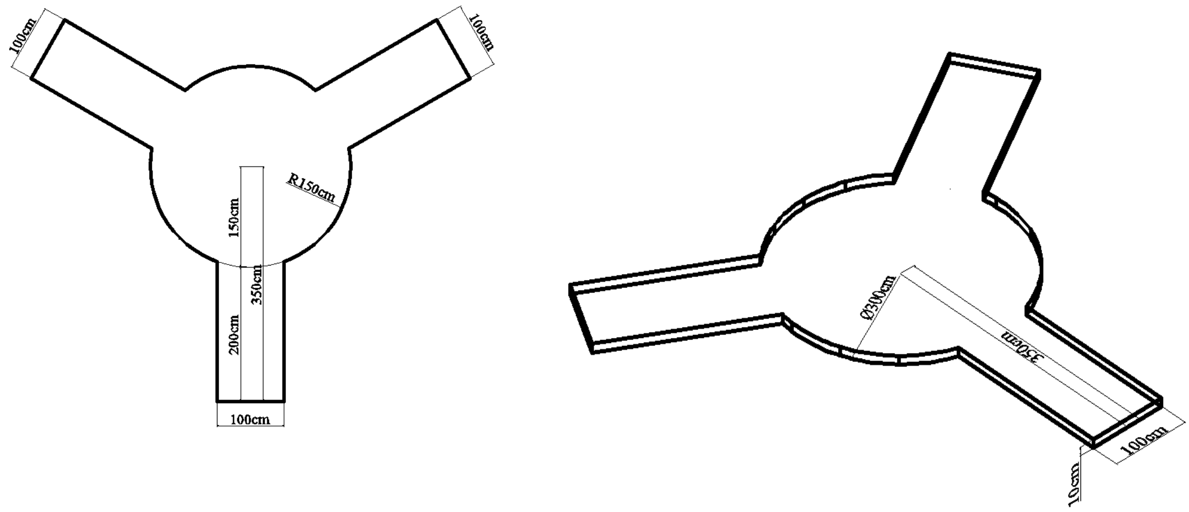

Figure 4.2.1. a) Steel Frame (from top) b) Steel Frame (perspektif)

Selected GCPs have been set up using of steel frame poured concrete on the field (Figure 4.2.2).

Figure 4.2.2: Poure concrete of GCP on the field.

GCPs have been painted white and black according to measuremens below (Figure 4.2.3 – 4.2.4).

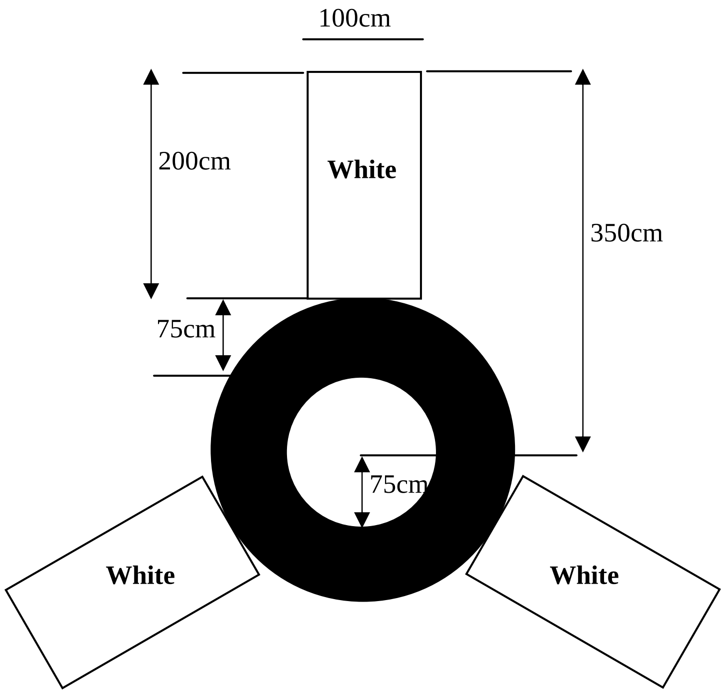

Figure 4.2.3: Dimensions of GCP

Figure 4.2.4 a) The GCP on the field b) The GCP on the image

In addition, 60,70,80,90,100,110,120 cm diametred circles have been set up on the field to investigate visibilities of the GCP size on the image. There are 75 cm spaces between every circle (Figure 4.2.5 – 4.2.6).

Figure 4.2.5 a) Painted circles on the field   b) Painted circles on the image

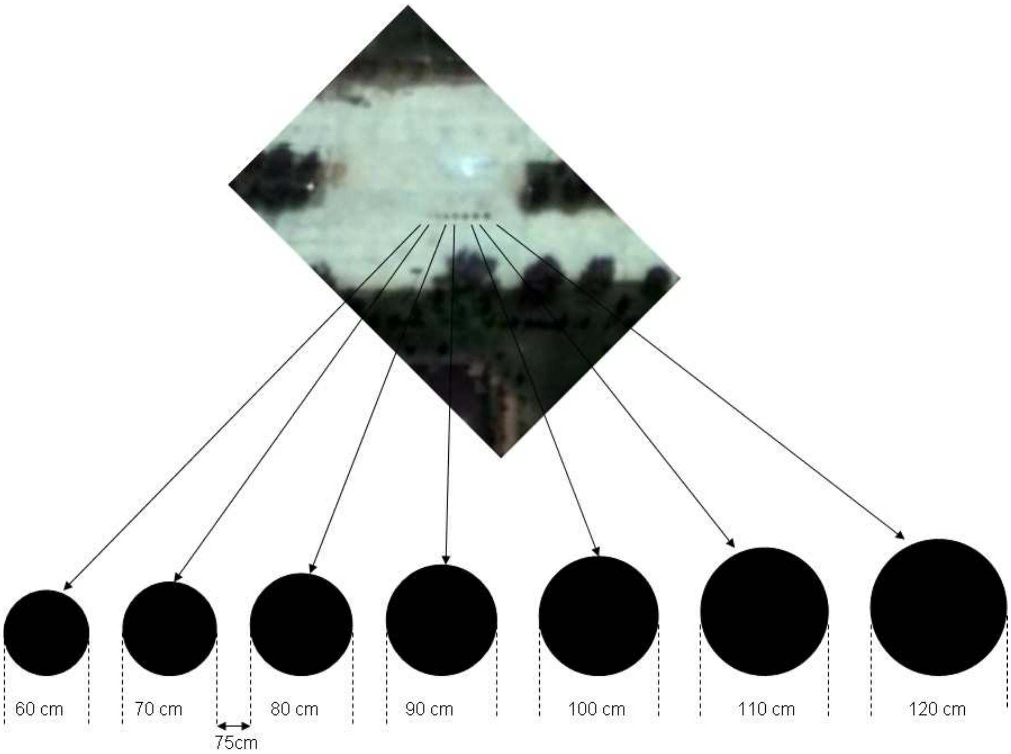

Figure 4.2.6 The statues of the painted circles on the image.

5 CONCLUSION

Rectification process could be done without ground control points. But, accuracy of rectification with ground control points is higher. Certainly, using ground control points of bigger size than satellite image resolution may increase visibility of these points. Therefore, the size of the control points is an important factor during analysis of images. Time of measurement, cost and accuracy are also important factors in map productions. Selection of an optimal size of ground control points may decrease both cost and consuming time of application. Moreover, some application errors may take place as results of using big size ground control points as it in small ones. The contrast of ground's color and differences between points color are also important factors in visibility of points. Image interpreting and coordinate readings are related to operator's ability, eye sensitivity, image's quality and resolution directly. The present study shows that the most suitable size of ground control point is about 1 m diameter points. At times, very GCPs small sized can be seen on the image but this is not true for every condition. In our test area, we can see 80 cm diameter circle but visibility is weak. So acording to this study about 1 m is optimal GCP size for rectification of World view 2. But, in order to get a standard of required ground control point sizes, ground control points should be investigated in stereo, gray-scale and different resolutions images. For example, this study can be aplied to different satellite images such as Geoeye, Ouickbird so.

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BIOGRAPHICAL NOTES

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