

UNIVERSITI TEKNOLOGI MARA

**THE OPTIMUM NUMBER AND EFFECT OF
GROUND CONTROL POINT DISTRIBUTION OF
THE MAP ACCURACY GENERATED FROM UAV
IMAGES**

NUR SYAFIQA BINTI SAIDIN

Thesis submitted in fulfillment
of the requirements for the degree of
**Bachelor of Surveying Science and Geomatic
(Hons.)**

Faculty of Architecture, Planning and Surveying

July 2019

AUTHOR'S DECLARATION

I declare that the work in thesis/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. Thus, thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student : Nur Syafiqah Binti Saidin
Student I.D. No. : 2016208926
Programme : Degree of Science & Geomatics - AP220
Faculty : Architecture, Planning & Surveying

Thesis/Dissertation Title : The Optimum Number and Effect of Ground Control
Point Distribution of the Map Accuracy Generated
from UAV Images

Signature of Student :

Date : 20th June 2019

ABSTRACT

In recent years Unmanned Aerial Vehicles (UAV) become popular in various sector and one such major sector is surveying applications. Ground Control Point (GCP) collection being the most deciding factor for accurate result. The intent of this research is to investigate the optimum number and effect of GCP distribution of map accuracy generated from UAV images. A fixed wing platform with the sensor of digital camera PowerShot SX230 HS is used in the image acquisition process. The images were collected at an altitude of approximately 150 m around UiTM area. Agisoft PhotoScan software is used in the image processing process after all the required images is obtained. GCP are utilized in the indirect geo-reference process for the images of UAV. In this research, GCPs scattered and GCPs with well distributed is tested to determine the best accuracy. Besides, through the method of GPS RTKnet, 20 verification or also known as check point were established in the research area in order to determine the accuracy of photo. The analysis shows how much the accuracy amends with the increase in the number of GCP and the paramountcy of uniform distribution. The analysis included an examination of the distribution of error based on the distribution of the GCP and reporting of Root Mean Square Error (RMSE). Significance testing of result showed there is significant difference in the RMSE report for the scattered and well distributed GCPs. The RMSE is slightly increase when the GCPs is scattered. From this study it can be concluded that the increasing in the number of GCP the distribution of the GCPs affected the map accuracy generated from UAV images.

TABLE OF CONTENT

CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
SUPERVISOR'S DECLARATION	iv
ABSTRACT	v
ACKNOWLEDGEMENTS	vi
TABLE OF CONTENT	vii
LIST OF FIGURES	x
LIST OF TABLES	xii
LIST OF ABBREVIATIONS	xiii
CHAPTER ONE	1
INTRODUCTION	1
1.1 Introduction	1
1.2 Research Background	1
1.3 Research Gap	3
1.4 Problem Statement	6
1.5 Aim and Objectives	7
1.6 Research Question	7
1.7 Scope and Limitation of Research	8
1.8 Study Area	8
1.9 Significant of Study	10
1.10 Chapter Outline	11
CHAPTER TWO	12
LITERATURE REVIEW	12
2.1 Introduction	12
2.2 Introduction of UAV	12
2.2.1 UAV Photogrammetry	13
2.2.2 Types of UAV	13
2.3 Ground Control Point (GCP)	16
2.3.1 GCP Acquisition	16
2.3.2 The Distribution of GCP	17
2.3.3 The placement of GCP	18
	vii

3.8	Map Generation	44
CHAPTER FOUR		45
RESULT AND ANALYSIS		45
4.1	Introduction	45
4.2	The Comparison of the Visual Quality of Orthophoto Generated based on Various GCP Configuration	45
4.2.1	The Quality of Orthophoto Generated based on Different GCP Distribution	45
4.2.2	The Quality of Orthophoto Generated based on Different Number of GCP	47
4.3	The Photogrammetric Accuracy based on Various GCP Configuration	49
4.3.1	The Photogrammetric Accuracy based on Various GCP Distribution	49
4.3.2	The Photogrammetric Accuracy based on Various Number of GCP	52
4.4	The Comparison for All GCP Configuration	54
4.5	An Ideal GCP Configuration for Photogrammetric Geo-Referencing Process	55
CHAPTER FIVE		57
CONCLUSION AND RECOMMENDATION		57
5.1	Introduction	57
5.2	Conclusion	57
5.3	Recommendation	58
BIBLIOGRAPHY		59