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# CONTENTS

<table>
<thead>
<tr>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>POTENTIAL USE OF UAV PHOTOGRAMMETRY TECHNIQUE FOR CADAstral MAPPING: A REVIEW</td>
<td>4</td>
</tr>
<tr>
<td>OBJECTIVE &amp; METHODOLOGY</td>
<td>5</td>
</tr>
<tr>
<td>FINDINGS CONCLUSION &amp; MAIN REFERENCES</td>
<td>6</td>
</tr>
</tbody>
</table>
POTENTIAL USE OF UAV PHOTOGRAMMETRY TECHNIQUE FOR CADAstral MAPPING: A REVIEW

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Abstract: A cadastral is an official record of information about land parcels. Cadastral surveying is work involving determination of boundaries and area of a lot of land or more. There are many techniques that have been employed for producing map or plan of cadastral boundary around the world. An example of these techniques are conventional survey, conventional photogrammetry, satellite imagery and unmanned aerial vehicle (UAV) photogrammetry. Among these techniques, the most common used technique for cadastral mapping is conventional survey. This technique was used for a long time ago and can provide very high accurate output, however, it has constraints from the aspect of time consuming and expensive cost. Rapid development around the world especially in developed countries cause the changes of techniques for mapping cadastral boundaries. Therefore, mapping the cadastral boundaries for update purpose needs to be performed regularly or many times. Due to the development of robotic industry, UAV system which utilised robotic concept and system can be used as a platform for data acquisition in the field of geospatial and photogrammetry. UAV offers many advantages such as portable, rapid data acquisition, efficient, low-cost and produces accurate results. All these advantages are suitable, valuable and significant for cadastral mapping application. Development of UAV has grown very rapidly where many new types and model of UAV were developed which can use many types of sensor. This situation encourage the use of UAV in many applications especially for mapping application. Therefore, this paper reviews the potential of UAV system used in cadastral mapping by examining related research done around the world and at national level using UAV system for cadastral mapping. This review will also focus on the quality of final output, methodology used and hopefully it can be used as a guideline for future work on the implementation of UAV system in cadastral mapping.

Keywords: Photogrammetry, Cadastral, Mapping, Unmanned Aerial Vehicle System, Sensor.

INTRODUCTION

Recently, the demand of unmanned aerial vehicle system have increases due to the rapid development and production of robotic system. Many fields have used UAV as a data acquisition platform to collect the geospatial data. UAV system have advantages instead of conventional photogrammetry. UAV have capability to produce a high resolution digital imagery, no cloud cover, rapid data acquisition, low cost system and able to generate high accuracy photogrammetric product. Cadastral is land information system. Meanwhile, cadastral survey is the process of determine and measure the position, size and
boundary mark of a piece of land parcel. Cadastral is very important for society and government. Basically, cadastral is partially of process to register the property of person. Nowadays, cadastral survey demand the accurate, low cost and faster method to reduce the period of registration the land or property. Therefore, UAV system seen have potential to fulfil the demand in cadastral survey. However, the exploration of the system for cadastral survey is still lacking and new especially in Malaysia. Hence, this paper is to review ability of UAV system to use in cadastral application.

OBJECTIVE

The main objective of this paper is to review the potential of unmanned aerial vehicle system or UAV used in cadastral application. The capability of UAV used in cadastral application is evaluated and reviewed from the past publications have been made by researchers around the world related to UAV and cadastral mapping.

LITERATURE REVIEW

Unmanned aerial vehicle (UAV) can be defined as a system used to capture the aerial photograph or collect any information on the earth surface with no pilot on board. According to (Bailey, 2012), UAV is a motorized aircraft system controlled remotely by remote control devices or completely autonomous with aid of on-broad system of navigation and ground control station. UAV can described as a device for collecting remote sensing data where it allow flexible manoeuvre, produce high resolution image, can fly under cloud cover, easy to operate, rapid data acquisition and low cost. Due to these advantages, UAV has been used in various application such as mapping, monitoring, mining, scientific research, agriculture, archelogy and others. Over last few years, there are many types of UAV with special sensor such as digital camera that have been produced by the manufactures around the world. Until today, UAV can carry many sensor such as Lidar, multispectral, thermal, hyperspectral, compact digital camera and real time kinematic (RTK) GPS receiver. RTK UAV is the latest systems designed to generate a very high accurate output ranging to a few centimetres.

Manufacturing of RTK UAV create a chance and potential for UAV system to be used in application like cadastral mapping. Cadastral is the field that is used to determine the position, size and boundary mark of piece of land as the property of a person. While, cadastral surveying work is for the purpose of land ownership and registration in accordance with Government Regulation. According to Cadastral Rule Survey 2009, cadastral survey is to produce as issued in the State Land Act 1965, Licensed Land Surveyors Act 1958 and Regulations of the Land Cadastral Surveying Department. Multipurpose cadastral is an example of cadastral application. Multi-purpose cadastral can be defined as cadastral overlay delimiting the current status of the property owner. The individual building block for the overlay is the cadastral parcel, an unambiguously defined unit of land within which unique property interest property interests are recognized. The overlay will consist of a series of maps showing the size, shape and location of all cadastral parcels within a given jurisdiction. Figure 2 shows an example of cadastral boundary in Zurich, Switzerland (Manyoky et al., 2012)

Accuracy of final product are very important aspect in this application where every measurement or survey must follow the standard operating procedure (SOP) has been set by national surveying department and the final output needs to checked and endorsed. There are various technique that can be used for application of mapping cadastral boundary around the world. Among the techniques are conventional survey, conventional aerial
photogrammetry, high resolution satellite imagery and UAV photogrammetry. In Malaysia, conventional survey is the most common technique used to map the cadastral boundary from the colonial time until today. Conventional survey such as total station and Global Navigation Satellite System (GNSS) can produce a very high accuracy in term of generation the output in the form of points and lines, however they have constraints from the aspect of time consuming and required expensive cost (Harintaka, Susanto and Hartono, 2009). Therefore, demand of fast and efficient surveying method caused a new method or system needs to be explored to support and helps to fulfil that demand. The system can fulfil that requirement is UAV photogrammetry.

FINDINGS
The findings is UAV has bright potential to be use in cadastral application. Many publication states the UAV system have advantages over conventional methods in term of costing, time consuming, less man-power and able to offer additional information rather than conventional methods. Accuracy of final products is very important aspect in cadastral mapping. Every final product must follow and achieved the existing standard accuracy stated by National Department of Survey. In this case, UAV system also able to fulfil that requirement.

CONCLUSION
This review aims to explore the potential use of UAV photogrammetry in mapping cadastral boundary. Three aspects are discussed in this paper which have relation between each other. However, these aspects are very important element in cadastral application and as an indicator to study and analysed the potential use of UAV system for this application. As a conclusion, UAV system really has great potential to be used in cadastral mapping due to the advantages offered by the system as compared to conventional method. The national surveying department could benefited from UAV photogrammetry for producing rapid, fast, low cost and accurate cadastral map.

MAIN REFERENCES