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Transforming Innovation into Opportunities:
Embracing IR 4.0

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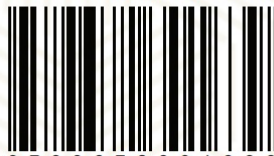
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DRONE APPLICATION IN LANDSCAPE ARCHITECTURE STUDIO SUBJECTS

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ABSTRACT: Topography study is one of the attributes in the site inventory and analysis for landscape architecture studio course. The study requires students to make their judgement on the topography of the site according to SWOT analysis. This traditional way of analysis is based on perception of students which may inappropriate and requires a lot of time. This innovation in teaching presents the alternative of performing inventory analysis of topography study using drone and Agisoft, UAV or drone is a method of using technologies in teaching which advancing the site inventory and analysis of a landscape architecture project to the next level. Replacing the photography technique to more systematic and coordinate create the information more accurate and other unnecessary issues can be avoided. This method is safer, cheaper, and faster than conventional method. With this, students shall focus on designing process more. This method can further develop to a teaching module using drone which can be used for training students, lecturers, practitioners. The training can be charge with suitable fee.

Keywords: Agisoft software, Landscape architecture, Studio project, Topography study, Unmanned aerial vehicle.

1.0 PROBLEM STATEMENT

Studio Based Courses in Landscape Architecture Program involves with site inventory, analysis, and synthesis where requires landscape architecture students to do topological study. Understanding on accurate information of topology for their project avoid student to do mistakes in their design (Abdullah, Yaakub, and Wahil, 2015). False information of topology resulted to poor drainage planning and the landscape design unable to survive in rain condition.

Conventionally, students require to visit the site to gather on topology before the do their landscape design. They use basic survey tools such as measuring tapes, distance measuring wheels, compasses, and GPS to get the information and

then transform it to a drawing manually (Figure 1). Then, with the information, the contour map is produce to study the landform of the site (Figure 2). The process on site inventory and analysis continues by students performing the judgment on the information according to strength, weakness, opportunity and threats which known as SWOT analysis (LaGro Jr., 2013).



Figure 1 Students gathering the information of topography using traditional method



Figure 2 Transforming process of information from site into a topology map

This traditional way of analysis is based on perception of students where its take a lot of time. Therefore, new method of studying topological information is needed to create the learning process

more effective and enjoy at the same time. Applying new technology increase students availability to fit with skills for IR4.0.

2.0 PRODUCT/INVENTION/IDEA OBJECTIVES

This teaching innovation presents the alternative of performing drone application in topology study of site analysis for landscape architecture studio course. Agisoft is software developed to elicit the information from the coordinated images. The images are required to collect by students during field study. The method for gathering the coordinated images is by performing flight plan using drone and PrecisionFlight apps.

3.0 PRODUCT/INVENTION/IDEA DESCRIPTION

The innovation consists of three components of technology which are (a) unmanned aerial vehicle (UAV) or drone, (b) PrecisionFlight mobile app, and (c) Agisoft Metashape. Firstly, an unmanned aerial vehicle (UAV) or Drones is an aircraft that carries no human pilot or passengers (Hassan, Harun, and Md Sakip, 2018). Drone is fully controlled remotely by students in doing data collection for site inventory. Secondly, PrecisionHawk's PrecisionFlight mobile app is used for DJI drone as an advanced remote controlling tool in creating the flight plans and capture aerial imagery. This procedure used to capture the coordinated images that fits for the next process (Meng, Peng, Zhou, Zhang, Lu, Baumann, and Du, 2020). Lastly, Agisoft Metashape is a stand-alone software product that performs photogrammetric processing of digital images and generates 3D spatial data to be used in doing data analysis for topological studies (Li, Chen, Zhang, and Jia, (2016).



Figure 3 Coordinated image captured by a drone



Figure 4 DJI Drone used as UAV tools to capture the coordinated images

On March 2021, thirty-eight of second year students from Bachelor of Landscape Architecture Program completed their field study at Bandar Pasir Mas, Kelantan for their final project. Thus, this innovation was tested during their field study at Bandar Pasir Mas, Kelantan which advancing their site inventory and analysis of the landscape architecture project to the next level.

4.0 PRODUCT IMPACT/INVENTION/IDEA

This method is safer, cheaper, and faster than conventional method. With this, students shall focus on designing process more. This method can further develop to a teaching module using drone which can be used for training students, lecturers, practitioners. The training can be charge with suitable fee and to the extend where professional certificate can be provided.



Figure 5 Drone training provides for upskilling students' knowledge

5.0 PRODUCT DIAGRAM/INVENTION/IDEA

The innovation involves with three stages, namely, (i) flight plan stage, (ii) flying stage, and (iii) mapping stage (Figure 6). Firstly, flight plan process is where students perform flight plan using PrecisionFlight apps. This stage students plan selects their study area and control the height of drone to be flying. After first stage is complete, flying stage is performed by connecting the flight

plan in PrecisionFlight with drone. Flying the drone requires the open area to make sure the drone can safely departure and landing after the jobs finish (Figure 7). The process took about 15 to 20 minutes. For big area, the process requires more than a flight plan. Finally, the images are gathered in Agisoft. Using Argisoft, mapping of the site is generated (Figure 8). The software produces information of topology such as mapping and contour of the landform.



Figure 6 The three stages involved in the teaching innovation



Figure 7 Flying Stage requires open space to avoid accident

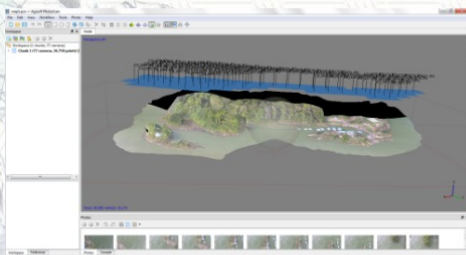


Figure 8 Third Stage process to generate topological map in Agisoft

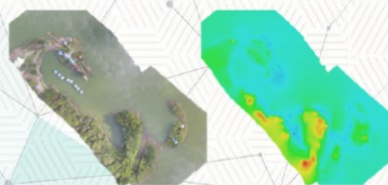


Figure 9. Maps produced by Agisoft more presentable and accurate

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