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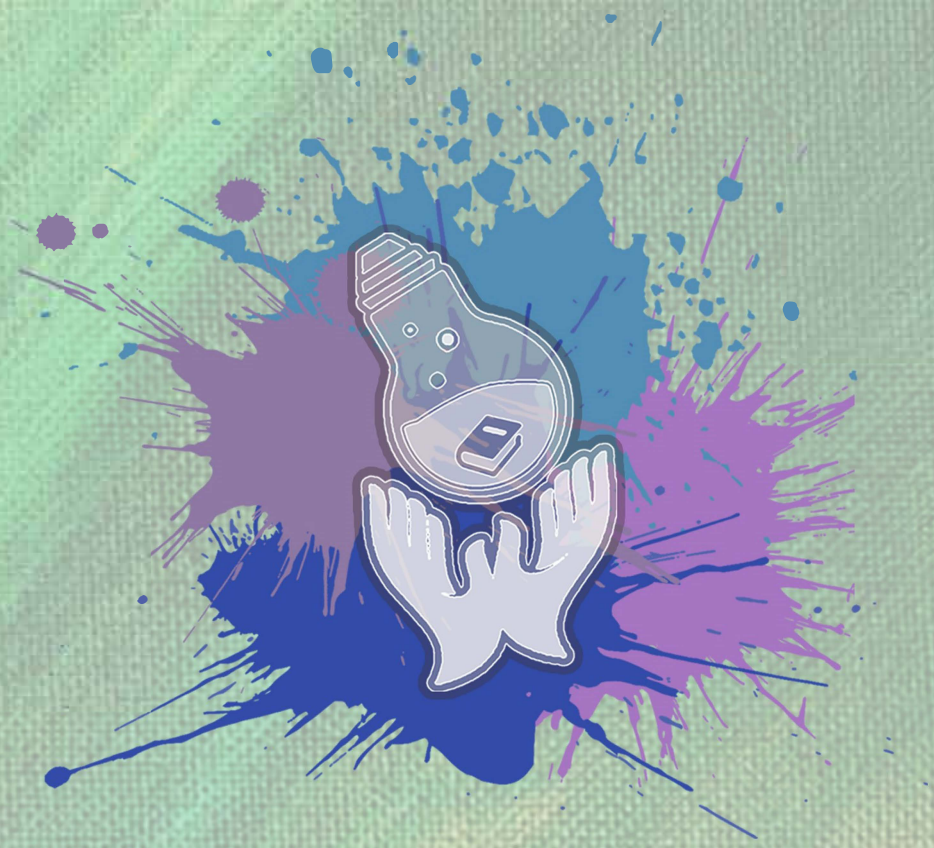

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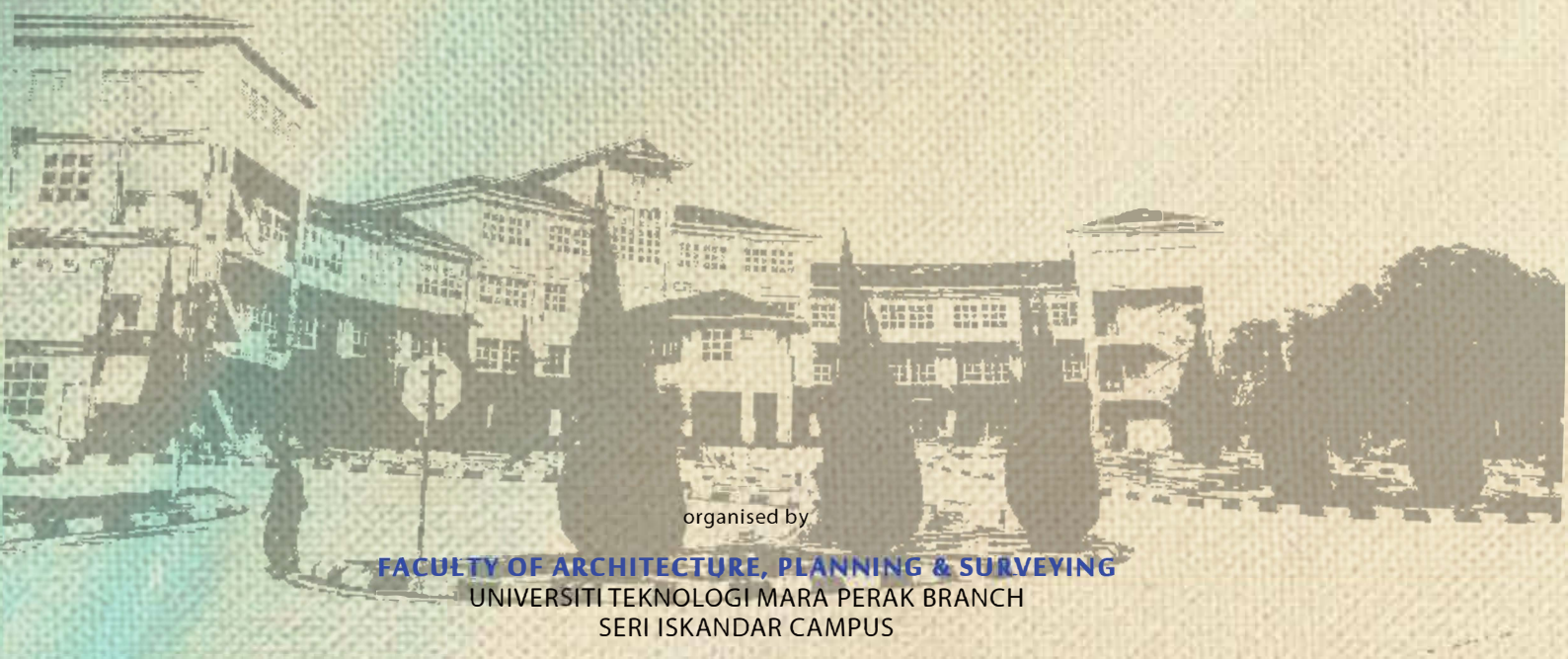

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THE NEW CONCEPT OF PAINTING WORK BY SMART UNMANNED AERIAL VEHICLE

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Abstract:
This paper describes a new concept of painting work by using Smart Unmanned Aerial Vehicle (SUAV) that can do the painting work in the construction industry. This project idea comes from a concept idea that emerges from a combination of two different technology which is Unmanned Aerial Vehicle (UAV) and Spray Painting. The spray painting using a UAV, expected will be suitable for construction industrial applications because UAV can be variety of size especially at confine, narrow space and the height of building that give limitation of space for the labour to do the painting work. The SUAV is motivated by the potential of safety, accurate and fast painting work. The SUAV is a drone that has been custom fitted with an arm plus a spray. Painting using a UAV has the potential to produce actual (predictable and repeatable) painted appearance, to be low-cost, and importantly to avoid the need for scaffolding and ladders which is the safety of the worker in high-rise building due to fall is secure. The primary purpose of this study is to gain the current issue on painting work that used a conventional method that can cause of accident and hazard to the worker safety and innovate it to better painting work by using a painting UAV that is relevant to the concept of industry revolution 4.0.

Keywords:
Painting; Drone; UAV

1.0 INTRODUCTION

The presence of drones in construction means significant changes within the industry. Drones are now used not only for military purposes. In this era, drones currently are primarily used for capturing pictures and shooting. However, other fields of application are also conceivable. Nowadays, one of the emerging technologies is drones. Drones are unmanned aerial vehicle that are controlled remotely by a human interface and are used to accomplish various tasks. A drone is very versatile that can be small or large, fast or slow. Drone technology has the ability to be applied in just about any field including construction. Drones have become increasingly employed for a wide range of usages; for example, roofers are using drones to inspect roofs. Four primary types of drones are directly applicable to construction practices: Contour crafting, transportation, surveying, and monitoring (Ruggiero et al., 2016). Smart Unmanned Aerial Vehicle (SUAV) is a drone that can autonomously spray paint both flat and 3D surfaces that has limitation of space to labour in order to paint confine, narrow space and the height of a building without the need for scaffolding and ladders. The SUAV expected will be better for painting work that is relevant to the concept of industry revolution 4.0 in order to go toward futuristic and advanced construction for providing an efficient and safer workplace in this industry.

2.0 LITERATURE REVIEW

Unmanned Aerial Vehicle Spray Painting a system for autonomous spray painting using a UAV, suitable for construction industries in painting work. The Unmanned Aerial Vehicle Spray Painting or PaintCopter is a quadrotor that has been custom fitted with an arm plus a spray gun on a pan-tilt mechanism (Vempati et al., 2018). Painting using a UAV has the probable to produce accurate (predictable and repeatable) painted appearance, to be low-cost, and to avoid the need for scaffolding and ladders which means the safety of the workers is promise harmless since there is no need for scaffolding and ladders.

2.1 Drone and Spray Painting speed the painting work

Painting is also considered to be the tough process and it also has to paint the whole building. To make this painting work easier and secure, the painting by UAV was introduced. In Singapore, roboticists at Nanyang Technological University created the PictoBot, which uses a robotic arm to paint building interiors 25 percent faster than humans can. The Smart Bee or UAV spray painting measures dry film thickness, which is the industry standard for evaluating quality and cost. The Smart Bee will slap 5,000 to 12,000 square feet of paint per hour on structures up to 100 feet high (Stone, 2017). At the same time, painter or labour can prepare 50 square feet and paint roughly 150 square feet per hour, the project will take about 57 hours (2,108÷50=42.16 hours to prepare the area; 2,108÷150=14.05 hours to paint the area) (Parker, 2014).

3.0 METHODOLOGY

3.1 Literature Review

A literature review is a critical and in-depth evaluation of previous research. The main purposes of applying literature review method in this research are to achieve the goal and to convey the knowledge and ideas have been established with regarding to this topic. The literature review serves to demonstrate and more understanding and knowledge of theoretical and research issues related to the topic. Related literature refers to writing in publication such as books, journals, magazines, articles, newspaper and finding information on the internet. Furthermore, literature review helps and guide to discovered more knowledge and helpful in this research. Most articles shall be about Unmanned Aerial Vehicle, spray painting and dangers of conventional method on painting work to make an idea of problem solving.

4.0 ANALYSIS AND FINDINGS

4.1 Health and safety issues of painter

A study had shown that painting work in construction industry by labour or painter that can cause an accident and long-term effect to the health of the labour. It is obvious that painters had the highest rate of accidents involving 'fall of person' (32.2%) and painter also had the highest rate of 'contact with chemicals'. Hence there seem to be two specific hazards associated with painting: falling and exposure to paint. Although the latter represents only 3.5% of accidents the long-term effects of exposure to paints and solvents are much more serious (Helander, 1991). Moreover, fall from heights is the most common occupational fatal hazard, with 26 and 15 cases reported in 2014 and 2015 respectively (Ayob et al., 2018). Falling of people is also the one of higher percentage happening accidents in the construction site. People working in the construction site has the risk exposed to fall in any place of the site especially at the high level. Most of the worker fall from the higher level mostly resulted in death. The type of accident is always occurred in construction which is fall from scaffolding. In addition, according to the Occupational Safety and Health Administration in United State, the most dangerous thing a worker can do is climb a ladder (CHOI, 2017). At the same time, falls are also critical cause of accidents with an annual average of 1042 cases in Malaysia. According to the Occupational Injury and Illness Classification Manual, falls can be grouped into 11 categories (Chong et al.,2014). There two cause falling of people during painting work; namely falls from ladders and falls from scaffolding or staging.

Furthermore, painting work in confine space also can be a dangerous work, the operation performed in the confined space such as painting with coating containing toxic or flammable substances that can explode because of the presence of contaminants on surfaces or in the atmosphere. Contaminants maybe in the form of solids, liquids, sludges, gases, vapours, fumes, or particulates (DOSH,2010). The SUAV expected will be suitable for construction industrial applications because falling of people, work in confine space and exposure to paint that contain of chemical during painting work can be eliminated.

5.0 CONCLUSION

The construction industry is evolving at a rapid rate, and with all the innovations and changes to traditional methods comes the need for greater efficiency in every aspect for construction industry in future. In order to increase the efficiency workflow and the safety of the labour in painting work, Smart Unmanned Aerial Vehicle need to be developed and used in local or regional authorities to improve the standard of current construction industries in order to achieve the goals toward industry revolution 4.0.

REFERENCES

Ayob, A., Shaari, A. A., Zaki, M. F. M., & Munaaim, M. A. C. (2018). Fatal occupational injuries in the Malaysian construction sector–causes and accidental agents. IOP Conf. Ser.: Earth Environ. Sci., 140, 012095. Retrieved April 8, 2019, from 10.1088/1755-1315/140/1/012095

CHOI, C. (2017, January 5). Air Brushed: New Drones Make Painting Easier – InsideUnmanned Systems. Retrieved April 8, 2019, from http://insideunmannedsystems.com/air-brushed-new-drones-make-painting-easier/

Chong, H. Y., & Low, T. S. (2014). Accidents in Malaysian Construction Industry: Statistical Data and Court Cases. International Journal of Occupational Safety and Ergonomics, 20(3), 503-513. Retrieved April 8, 2019, from 10.1080/10803548.2014.11077064

DOSH. (2010, January 1). Official Website Department of Occupational Safety and Health - Industrial Hygiene. Retrieved May 28, 2019, from http://www.dosh.gov.my/index.php/en/legislation/codes-of-practice/industrial-hygiene

Helander, M. G. (1991). Safety hazards and motivation for safe work in the construction industry. International Journal of Industrial Ergonomics, 8(3), 205-223. https://doi.org/10.1016/0169-8141(91)90033-i

Parker, J. (2014, October 27). How to Estimate Exterior Commercial Painting? Retrieved April 20, 2019, from https://www.performance-painting.com/blog/how-to-estimate-exterior-commercial-painting

Ruggiero, A., Salvo, S., & St. Laurent, C. (2016). *Robotics in Construction.* Worcester: Massport

Stone, Z. (2017, January 21). DRONES ARE THE FUTURE OF PAINTING. Retrieved April 20, 2019, from https://www.ozy.com/fast-forward/put-down-your-brush-drones-are-the-future-of-painting/79198

Vempati, A. S., Kamel, M., Stilinovic, N., Zhang, Q., Reusser, D., Sa, I., Nieto, J., Siegwart

R., & Beardsley, P. (2018). PaintCopter: An Autonomous UAV for Spray Painting on Three-Dimensional Surfaces. *IEEE Robot. Autom. Lett.*, *3*(4), 2862-2869. Retrieved March 25, 2019, from 10.1109/lra.2018.2846278