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The effectiveness of disinfectant spraying based on drone technology

The effectiveness of disinfectant spraying based on drone technology

T Andrasto, U M Arief, Subiyanto, S Sukamta, V N Sulistyawan, E Sarwono, A A Alfian, P Wicaksono, P N Amelia, A D H Putra

Departement of Electrical Engineering, Universitas Negeri Semarang, Semarang, Indonesia.

tatyantoro@mail.unnes.ac.id

Abstract. The disinfectant spraying activity includes a part of efforts to prevent the spread of Covid-19. Spraying is usually done by manual method. This condition results in uneven spraying and it takes a long time. So, automatic disinfectant sprayers is the way to resolve this problem. This study aims to determine the effectiveness of disinfectant spray devices based on drones. The application of automation is obtained from the use of drone technology and testing the spraying in interval time. This research is conducted by using a drone design study method and field testing. The design of the drone as a spray tool is based on the basic assembled X6 tarot framework. The drone that will be used later can lift up to 6 kg as a maximum weight. The design stage begins by conducting a literature study of the type of control use. Control settings are made by calibrating the device to the drone's load to obtain the maximum movement. The use of drones for spraying disinfectant liquid is done by taking off using the flying mode automatically regulated through the Mission Planner software. The results showed that the prototype drone uses a 6-liter tank capacity with a flight time of 6-8. In this case, the use of drones as disinfectant sprayers can facilitate spraying activities and cut down on application time.

1. Introduction

There were two cases of Covid-19 that occurred in Indonesia on March 2, 2020 [1]. The increase in positive cases of Covid-19 continues to grow rapidly until the end of May 2020. Based on data reported until May 26, 2020, there were 23,165 positive cases of Covid-19 in Indonesia [2]. The implementation of disinfection is increasingly being carried out by various parties aimed at breaking the chain of transmission [3]. Disinfection is the process of reducing the possible number of microorganisms to a lower level of danger [4]. Various disinfectant spraying activities included in the part of efforts to prevent the spread of the Covid-19 virus. Spraying is usually done by manual methods. This condition results in uneven spraying and requires a relatively long time. One way to overcome this is to use an automatic disinfectant sprayer. In line with developments, unmanned aerial vehicle (UAV) is a technology that has enormous potential based on its capabilities. UAV is an aircraft that is autonomous and can be controlled manually via radio control or automatically by processing sensor data so that it can fly according to user needs [5]. One of the UAV systems, namely drones can be used for spraying activities. During the Covid-19 pandemic, the use of disinfectants had

been widely applied to disinfect the surrounding environment, but spraying using automatic methods had not been widely applied. Then innovation is needed for spraying disinfectants. Through the design of a drone that is assembled with a special remote control, it aims to spray disinfectant liquid. The spray device designed has many advantages including the level of distribution of the disinfectant liquid that is sprayed more evenly, the safety factor of the sprayer because the distance between the drone and the controller can be adjusted, and minimizes the spraying time is shorter.

2. Methods

2.1. Methodology

The research methodology is needed in designing the drone system. The stages carried out include planning, making tools, and testing with the following explanation:

1. Stages of Planning, including drone design, selection of materials, and components. The drone system design is based on basic references in making drones. The design of the drone is based on the basic Tarot X6 framework. Drone design sketches are made using Corel Draw software, the selection of materials consists of the materials used to build the drone frame and the drone system as needed. While the selection of the right components needs to be considered in order to support system performance by producing good performance according to its function.
2. Manufacturing stages, including mechanical systems, electronic systems, and programs. Making a mechanical system that is drone assembly is based on a design drawing that has been made consisting of the dimensions of the drone framework in accordance with the plan drawings. The manufacture of an electronic system in the form of component placement must be adjusted to the drawing. Electronic components are placed on a mechanical system that has been assembled so that the electronic and mechanical components can form a unitary framework for the drone properly while the program is the structure of the work system as a whole.
3. Testing Stages, where the system will be tested after going through the planning and manufacturing stages is complete. Drone flight testing is carried out to obtain overall data when the drone is operating. If the testing phase is successful, data retrieval and analysis will be carried out.

2.2. Description of System

The drone system that works includes input, process, and output so that the drone can carry out direct flights. The input on the drone system is a remote control. In the process, there is a flight controller while the output there is an ESC which connected to each of the brushless motors. The system designed via a remote control command is then sent to the Naza-M V2 flight controller, and then the command is forwarded to the ESC to activate the brushless motor.

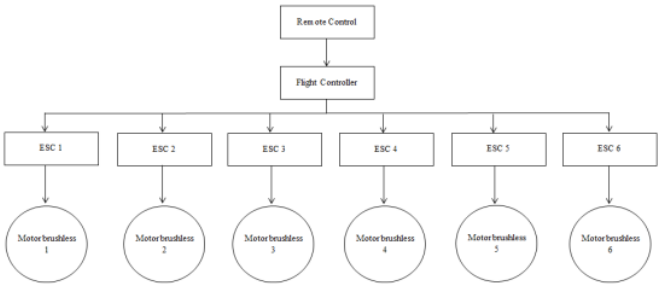

Figure 1. Block diagram system

The making of coordinate points was done using mission planner software. After the coordinates have been made, the pilot will send data to the flight controller. For the disinfectant, liquid is the same as

when flying with GPS-hold mode, namely by pouring the disinfectant liquid into the container that is attached between the landing gear of the drone. When taking take-off using waypoint mode, the remote control is used to activate the throttle button and direct the throttle button-up (up throttle). The drone will automatically take-off and aim at the coordinates that have been made. When the quadcopter is at the coordinate point, it must activate the spray button on the remote control. Then the water-pump will be active and spray disinfectant in the intended direction until it runs out. After finishing spraying, it is necessary to turn off the spray button on the remote control. Then the drone will automatically land at the predetermined coordinate point.

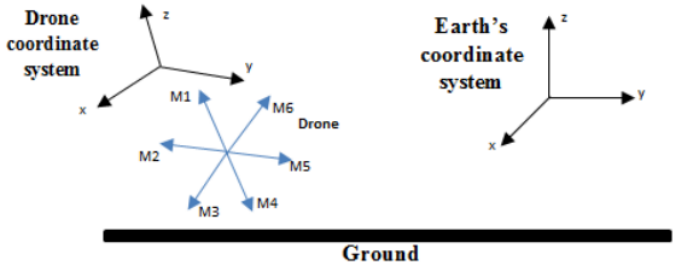

Figure 2. Coordinate drone (Way Point)

3. Result and Discussion

Mechanical and electronic designs that have been assembled will form the drone system. In Figure 3 shown below, you can see the overall mechanical system, in making this mechanical system an aluminum frame is used as the drone frame. The frame is equipped with a brushless motor as a propeller drive. There are 6 brushless motors used. The use of arms on the drone frame is adjusted to the number of brushless motors installed which aims to increase lift on drones that have a total payload or load that is approximately 10 kg.

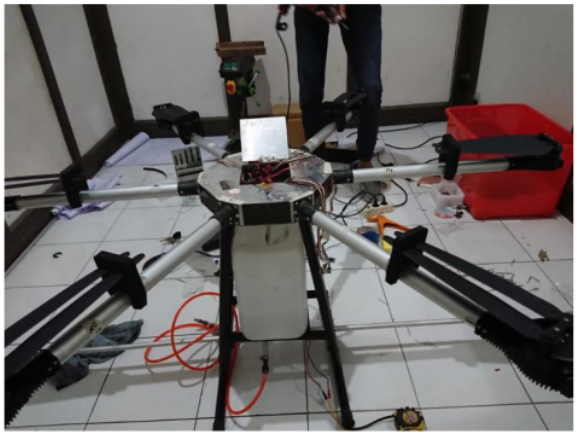

Figure 3. Mechanic System of Drone

Based on the results of field testing that has been carried out, the results of the test take-off status of the drone on the volume of pesticides, namely when lifting the load of the disinfectant liquid on the

drone with varying fluid volumes are shown in Table 1. Furthermore, the test of battery resistance on spraying duration in several times shows Table 2.

Table 1. Take-off status of the drone on the volume of pesticides

Test	Drone weight (gram)	Liquid volume (ml)	Take off status
1	4000	6000	Failed
2	4000	5500	Failed
3	4000	5000	Failed
4	4000	4500	Success
5	4000	4000	Success

Table 2. Battery resistance on spraying duration

Test	Drone weight (gram)	Battery power (mAh)	Spraying duration (minute)
1	4000	22000	6,55
2	4000	22000	7,32
3	4000	22000	8,06
4	4000	22000	7,46
5	4000	22000	7,50
Total (minute)			36,89

Based on the data in Table 2, spraying using a drone obtained an average spraying time with an experiment of 5 times, namely:

$$\text{Avarage} = \Sigma / n \quad (1)$$

$$\text{Avarage} = 36{,}89 / 5 = 7{,}38 \text{ minute} \quad (2)$$

4. Conclusion

Based on the results of testing the spray of disinfectant using drones that have been carried out, it can be concluded that the drone that has been designed is capable of flying well. However, there is a limit to the disinfectant liquid that the drone can transport, which is a maximum of 4500 ml so that the drone can take off successfully. The average spraying time obtained with a battery capacity of 22000 mAh is about 7.38 minutes. In the testing process, the remote control plays an important role in running the drone system, the components can operate according to their function and can spray disinfectant liquid. Spraying system using a drone can help in spraying easily and cut the amount of time needed.

References

[1] Susilo A, Rumende CM, Pitoyo CW et al. 2020 Coronavirus Disease 2019: Review of Current Literatures *Jurnal Penyakit Dalam Indonesia* **7** 45-67
[2] Anonymous 2020 *Situasi Terkini Perkembangan Novel Coronavirus (COVID-19)* (Jakarta: Ministry of Health)
[3] Athena, Laelasari E, and Puspita T 2020 Implementation of Disinfection in Prevention of Covid-19 Transmission and Its Potential Health Risk in Indonesia *Jurnal Ekologi Kesehatan* **19** 1 -20

[4] Anonymous 2020 *Penanganan Covid-19 Protokol Disinfeksi di Tempat Kerja* (Yogyakarta: Universitas Gadjah Mada)
[5] Hidayat R and Mardiyanto R 2016 Pengembangan Sistem Navigasi Otomatis Pada UAV (Unmanned Aerial Vehicle) dengan GPS (Global Positioning System) Waypoint *Jurnal Teknik ITS* **5** 898-903
[6] Yallappa D, Veerangouda M, Maski D, Palled V, and Bheemanna M 2017 Development and evaluation of drone mounted sprayer for pesticide applications to crops *IEEE Global Humanitarian Technology Conference (GHTC)* p 1-7
[7] Mogili UR and Deepak BBVL 2018 Review on application of drone systems in precision agriculture *Procedia computer science* **133** 502-509
[8] Wang G, Lan Y, Qi H, Chen P, Hewitt A, and Han Y 2018 Field Evaluation of an Unmanned Aerial Vehicle (UAV) Sprayer: Effect of Spray Volume of Deposition and the Control of Pests and Disease in Wheat *Pest Management Science* **75** 1546-1555
[9] Shaw KK and Vimalkumar R 2020 Design and Development of a Drone for Spraying Pesticides, Fertilizers and Disinfectants *International Journal of Engineering Research & Technology (IJERT)* **9** 1181-1185
[10] Munghate SD and Kadu PS 2020 Design and Development of Agricultural Spraying Drone: Frame and Analysis *International Journal for Modern Trends in Science and Technology* **6** 261-270
[11] Austin R 2010 *Unmanned Aircraft System UAVS Design, Development and Deployment* (United Kingdom: John Wiley & Sons Ltd)
[12] Anonymous 2016 *Make: DIY Drone and Quadcopter Projects* (San Fransisco: Maker Media, Inc)
[13] Kilby T and Kilby B 2016 *Make: Getting Started with Drones* (San Fransisco: Maker Media, Inc)
[14] Anonymous 2020 *Surat Edaran Nomor HK.02.02/III/375/2020 Tentang Penggunaan Bilik Disinfeksi Dalam Rangka Pencegahan Penularan Covid-19* (Jakarta: Ministry of Health)
[15] Anonymous 2020 *Pembersihan dan disinfeksi permukaan lingkungan dalam konteks COVID-19* WHO

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