Modification and Configuration Settings On Unmanned Aerial Vehicle (UAV) Model DJI Phantom 2 In Making First Person View Mode Feature

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Abstract

Unmanned Aerial Vehicle (UAV) or also called drone, is a technology that combines information about a particular location with a state-level high cruising. UAVs has many benefits in its use: in terms of defense and security can be used for Aerial Surveillance, mapping or entertainment. This research aims to develop a system called First Person View (FPV). FPV is the ability to obtain images that come directly from the camera. In this case mounted on the UAV body. Thus users can easily take Figures in the required area. FPV system development based on the Model DJI Phantom 2. It is reconstructed using the Component Based Development Model. Component-based development models is associated with object-oriented technology. This method is based on a system that has incorporated a number of existing components or systems COTS (Commercial off the shelf). Which can be obtained by buying or parts already made internally. FPV system is using wireless transmitter 5.8 GHz as a video transmitter mounted on UAV body. As a receiver using the built-in receiver that is already installed on the FPV monitor, to display the image.

I. INTRODUCTION

Indonesia is a country with a maritime or marine geographical location as well as the vast country has many islands. This makes Indonesia has many natural view is not shared by other ountries. For example, the island of Bali which has a beautiful coastline. Therefore, a lot of tourists, both domestic and from abroad who come to visit to see the beauty of this island. With the wide variety of beauty and uniqueness of the landscape in Indonesia, making the emergence of interest to perpetuate the existence of the scenery. Some are taking a Figure with the goal of its own inner satisfaction, there also took Figures for commercial purposes, there also took Figures to share information. In shooting, there is a wide variety of devices that use cameras. In accordance with its needs, and its respectively. Researchers divided the three categories in this study based on its usage, namely: the camera in water, on land camera, and the camera in the air. Basically the camera has the of prices are relatively expensive to assemble, although certainly very cheap when compared to using a real helicopter. In Manado, North Sulawesi, the use of unmanned aircraft multi- rotor type is still lacking. And if they see a need, there are many national and international events that take place in this area,

Manado is one of the tourist city with a rich maritime region in natural resources. Klabat University, one of the educational institutions in North Minahasa Regency, Manado - North Sulawesi, is a place where researchers are interested in developing unmanned aircraft of this type of multi-rotor. With the development of technology and the needs that exist, as already described in the previous paragraphs, the purpose of the research is to design features of drone FPV-type multi-rotor, using phantom DJI design to be modified.

Indonesia is a maritime country, with a marine geographical location as well as country with many islands. This makes Indonesia has many natural view which is not found in other countries. For example, the island of Bali which has a beautiful coastline. Therefore, a lot of tourists, both domestic and also from abroad who come to visit and see the beautiful island of Bali. The wide variety of beauty and uniqueness of the landscape in Indonesia, makes the emergence of interest to perpetuate the scenery. Some people take picture of the beautiful scenery just for their own satisfaction, there are also some who took pictures for commercial purposes, and some with a purpose of sharing information.

In taking picture, there are plenty variety of camera that is being used. In accordance with its needs, and its features. Researcher categories three groups in this study based on

its usage, which is: camera in water, on land camera, and the camera in the air. Basically camera has the same function, which is taking picture, but it is also supported by additional equipment which allows the camera to be used in all three categories.

Based on the three categories, the current use of the camera in the air is needed for various purposes, for example in terms of defense and security which is known as aerial surveillance. It also can be used for the purpose of mapping that can facilitate with the help of aerial photography and various other important uses. President of the Republic of Indonesia at this time Mr. Joko Widodo wants the use of drones, or unmanned aircraft to minimize illegal fishing practices (illegal fishing) in state losses.

Unmanned Aerial Vehicle (UAV), or drones, is an unmanned flying vehicle, is a technology that combines information about a particular location with a high level cruising. Drone has many different types and capabilities, according to the specifications of each. Currently evolving the type of aircraft Rotary Wing is a multi-type rotor, or can be called multi helicopter. By using more rotor of the helicopter, causing multi helicopter chosen more for the purposes of aerial photography. As for the various types or models, namely: Tri-Copter using three rotors, Quad-Copter using 4 rotor, Hexa-Copter using 6 rotor, even Octo-Copter which uses 8 rotor. Usually, the Quad-Copter and Hexa-Copter is the type that is being developed at this time.

DJI Phantom is an unmanned aircraft type rotary wing, the multi-rotor type which uses four rotors or so-called Quad-Copter. DJI is an aerial product which is quite famous in aerial activity. DJI Phantom comes with a package of RTF (Ready To Fly) where Quad-Copter has a variety of features that can allow the user to fly the device. Other features that exist in this Quadcopter, such as: GPS (Global Positioning System) as flight mode, to adjust the position of the Quad-Copter so that it can be easily monitored and controlled. Moreover Quad-Copter is equipped with a fail-safe feature.

There is one feature that is not included by DJI Phantom especially on version 2.0 of the QuadCopter, it is first person view (FPV) feature. FPV is one feature that allows the pilot to view realtime, as if the pilot is in the aircraft controlling, it also can be viewed through an additional monitor screen, or it could be in the form of special glasses that can display a real-time video. In this version, DJI Phantom 2 is not accompanied by a camera, so the camera must be purchased separately and with some modifications with additional tools such as mounting and stabilizer so that the camera can be assembled.

Today the use of muti-rotor, for developing regions is still minimal, this is because the information about the existence of drones is still limited, and in terms of prices it is relatively expensive to assemble, although certainly very cheap when compared to use a real helicopter. In Manado, North Sulawesi, the use of unmanned aircraft multi-rotor type is still less. By looking at the events, there are many national and international events that take place in this area, Manado is one of the tourist city with maritime region that is rich natural resources. Klabat University, is one of the educational institutions in North Minahasa Regency, Manado - North Sulawesi, is the place where researcher is interested in developing unmanned aircraft of this type of multi-rotor.

With the development of technology and the needs that exist, as already described in the previous paragraphs, the purpose of the research is to design features of drone FPV-type multirotor, using phantom DJI design to be modified.

II. METHODS

In this study, the method used is engineering research, which applies science into a plan in order to get the performance in accordance with specified requirements. The draft is a synthesis of design elements combined with scientific methods into a model that meets certain specifications. This research begins with determining the design specifications, choosing the best alternative, and proved that the chosen design can meet the requirements specified in efficiency, effectiveness and with low cost.

The method used in the modification and configuration settings unmanned aircraft design, in the manufacture of a first person view (FPV) can be seen in the following schematic drawings:

In the requirements analysis stage, the researcher seek references from the vendor's website, plenty of research and journals, and books to get all the information needed in designing these systems.

In the phase of component based

development models, things to do is make a blueprint of UAVs, in order to know which components can be used to modify.

When it comes to the configuration phase, the adjustment of cable, electricity according to data taken from an existing blueprint is done.

In each subsequent phase, step by step experiments is carried out in order to try some electrical power, the experiment of sending and receiving video signals.

III.   RESULTS

I. UAV model
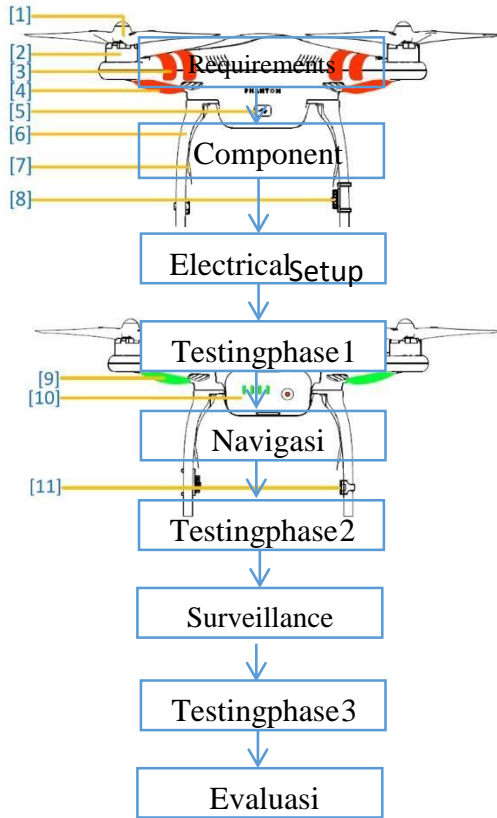
This is the outside appearance of drone DJI Phantom 2, with the following caption:
1. Propeller
2. Motor
3. Nose/ Front
4. LED Indicator
5. Micro – USB port
6. Landing gear
7. Antenna Receiver
8. Bus Connector
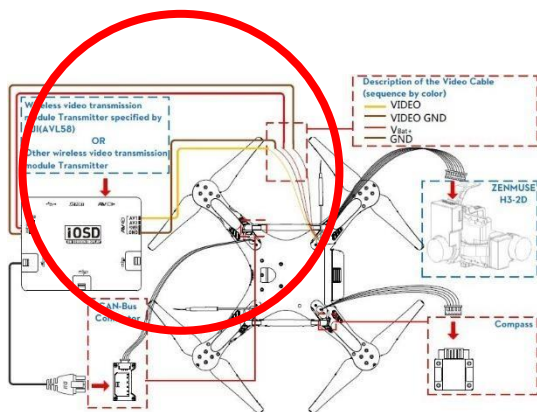9. Rear Led indicator
10. Battery power
11. Electric Compass

Figure 3.2 UAV Blueprint
This blueprint provide the wiring diagram, the main important parts are the cable that going to connect between UAV module with the video signal transmitter. There are 4 main cable with different color 2 with brown colors follow with red and yellow. Brown color indicates electricity, yellow indicate video signal, and red for the battery.
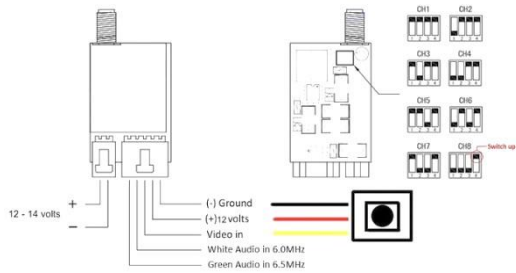
II. Component

Figure 3.3 wireless transmitter

The Wireless video transmitter used is Skyworld TS5823 5.8GHz, with 8 Channel runs in the range of 5700 GHz - 5900 GHz, with a choice of manual or automatic.
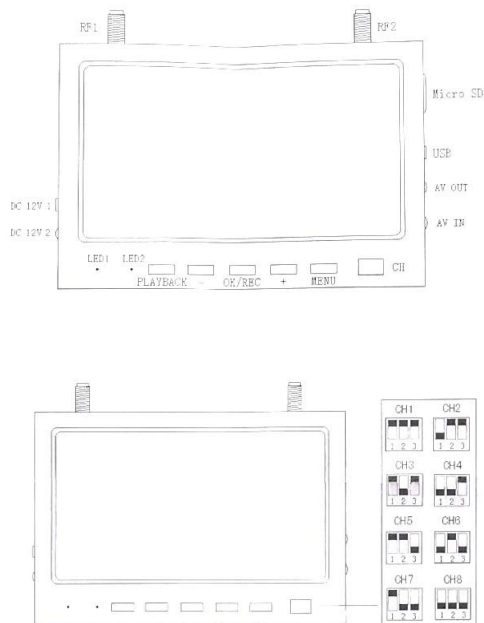

Figure 3.4 LCD Monitor built in wireless receiver.

Screen monitor used is the type Skyzone RC700D. The monitor is equipped with a wireless receiver, which will capture the video signal, so that is displayed directly on the screen monitor. This display runs with 5.8GHz range with a total of 8 channels manually or automatically.
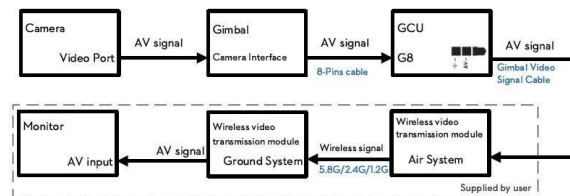
III. Installing parts

Figure 3.5 fpv basic scheme

As shown in Figure 3.5, the basic scheme of the shooting to be transmitted live to the screen is as follows:

1.   Camera
In this study using a GoPro Hero camera 3+ Black Edition. Pictures were taken forwarded into the gimbal / stabilizer camera through cable attached.

2.   Gimbal
Gimbal or stabilizer is a tool so that the camera can be balanced to withstand shocks or when the aircraft did hovering or yawning. So the picture is taken more stable. Stabilizer is also used as a connector to the board and the power contained in the unmanned aircraft.

3.   GCU
GCU or Generator Control Unit is a circuit board connector, which in this case the connector interface to connect with wireless video transmitter.

4.   Wireless   transmission   module (transmitter) Wireless transmission module is used to forward the captured video through cables to be transmitted wirelessly, through a wireless network with a range of 5.8GHz.

5.   Wireless   transmission   module (receiver) Wireless transmission module receiver, to capture the video signal that has been passed using the wireless transmitter module.

Monitor After receiving a video signal, the video displayed live into a monitor screen.
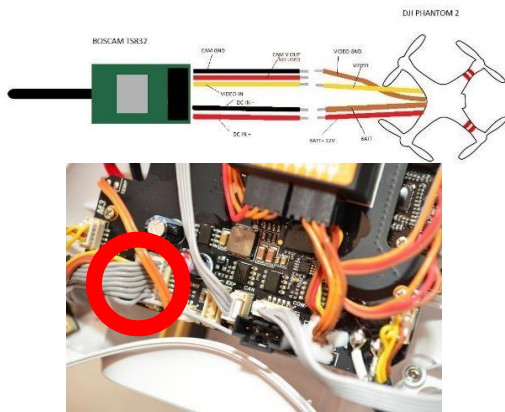
Figure 3.6 cabling diagram

Once we know the design, and cable diagram contained in the circuit board of UAV. Each cable needed, need to be installed in the circuit board at the right position in accordance with the architecture of the DJI Phantom 2. As shown in

Figure 3.6

Cable with the gray color is wired of electric, which will connect the circuit board with stabilizer gimbal camera.

IV. Testing

Figure 4.1 wireless video transmitter posision Wireless transmitter can be placed anywhere at the bottom of the DJI Phantom 2, and in this case mounted on the bottom of battery power.
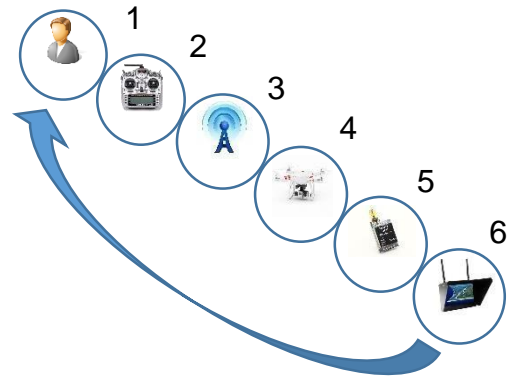

Figure 4.2 FPV system sequence

1. The user uses a remote controller
2. Remote controller will communicate via wireless
3. Wireless as a means of connecting with drone
4. The drones then execute the instructions received from the remote controller, to be forwarded to the camera
5. Camera shooting,
6. Pictures forwarded by the wireless transmitter

Receiver receives the image on the monitor screen, and the user can see on the screen in realtime.

DISCUSSION

In this study used wireless module power of 230 MW, which is 230 MW rated power sufficient for the needs of short range, between 50-200 meters. The signal can be received well if done in an open area of place. Range 5.8GHz run well without disturbing the wireless remote path that run on the 2.4GHz range.

Wireless on the camera, interfered with the existing navigation button on the remote controller, if switched on. In this situation, it is not suggested to switch the camera wireless on. Within less than 50 meters videos or video signals which appear in the monitor can receive clearly without interference. Flying Higher than 50 meters still can capture signal but there will be disturbances such as flickering on the monitor screen and often display a notification no signal.

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