Legal Analysis

Year: \_2019\_ Semester: \_Spring\_ Team: \_\_17\_\_ Project: \_Face Tracking Drone\_\_\_\_\_\_

Creation Date: \_\_\_\_Mar 18, 2019\_\_\_\_\_\_\_\_\_\_ Last Modified: March 3, 2015

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Assignment Evaluation:

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| **Item** | **Score (0-5)** | **Weight** | **Points** | **Notes** |
| **Assignment-Specific Items** | | | | |
| **Regulatory Analysis** |  | x3 |  |  |
| **Analysis of Patent 1** |  | x3 |  |  |
| **Analysis of Patent 2** |  | x3 |  |  |
| **Analysis of Patent 3** |  | x3 |  |  |
| **Writing-Specific Items** | | | | |
| **Spelling and Grammar** |  | x2 |  |  |
| **Formatting and Citations** |  | x1 |  |  |
| **Figures and Graphs** |  | x2 |  |  |
| **Technical Writing Style** |  | x3 |  |  |
| **Total Score** |  | | |  |

5: Excellent 4: Good 3: Acceptable 2: Poor 1: Very Poor 0: Not attempted

Comments:

1.0 Regulatory Analysis

Our project requires two important certifications, and they will be introduced as follows.

The most important license that our face tracking drone needs to pass is the one that is released by Federal Aviation Administration (FAA). Since our drones are designed for recreational purposes, there are three steps when it comes to registering the unmanned aircraft systems, which are [1]:

* Register the drone
* Review the rules
* Know where you can fly

For step one, since drone weighing more than 0.55 pounds must be registered and the face tracking drone that we designed belongs to that range, we must register the drones in order for it to fly legally. We need to first register the drones with FAA and the registration costs would be five dollars which will be valid for three years. And then we need to mark the drones with the registration number in case it gets lost or stolen.

For step two, we will include the rules in our user manual to notify users the rules that they need to obey, which includes [1]:

* Fly only for fun or recreation
* Follow the safety guidelines of a model aircraft community-based organization
* Fly at or below 400 feet when in uncontrolled airspace (Class G)
* Fly within visual line-of-sight, meaning you as the drone operator use your own eyes and needed contacts or glasses (without binoculars), to ensure you can see your drone at all times.
* Never fly near other aircraft.
* Never fly over groups of people, public events, or stadiums full of people.
* Never fly near or over emergency response efforts.

For step three, we will make sure to attach the document regarding where we can fly the drone to the user manual.

The second essential regulatory certification that we need to pass is Federal Communications Commission (FCC). FCC regulates the use of electromagnetic interference (EMI) and since almost all of the digital device will generate some amount of EMI, our drone needs to get the certification from FCC.

Our product has two sources of EMI, the first one, which is the most significant one, is the EMI caused by the RF communication between the microcontroller on the ground and the microcontroller controlling the drone, and the second one is less significant, which results from the clock circuit and other part of our designed circuit that would generate the EMI unintentionally.

The FCC regulates radio frequency (RF) devices contained in electronic-electrical products that are capable of emitting radio frequency energy by radiation, conduction, or other means. These products have the potential to cause interference to radio services operating in the radio frequency range of 9 kHz to 3000 GHz, and our device has the RF frequency of 2.4 GHz. Based on the categories shown on the FCC official website, the face tracking drone belongs to the intentional radiators, which defines as “a device that intentionally generates and emits radio frequency energy by radiation or induction that may be operated without an individual license” [2]. Since the face tracking drone is an intentional radiator, it needs to be approved using the certification procedure, which is the most rigorous approval process for RF Devices [3].

To avoid illegal operation performed by users, the remaining steps for the FAA are to include the rules in our user manual and to attach the document regarding permitted flying area to the user manual. For the FCC, additional step is enclosing the drone in a rugged plastic case, which will significantly reduces radio noise emissions. We will perform the noise testing before developing the prototype into a finished product. Once the product satisfies our requirement, we will send the device to a testing lab for formal FCC authorization.

2.0 Legal Liability Analysis

2.1 Analysis of Patent 1

Patent Title: “System and Method of High-resolution Digital Data Image Transmission”

Patent Filing Date: August 29, 2011

**Abstract:** The invention is designed to transmit still image or video stream from a unmanned aerial vehicle to a ground station. A camera will be fixed on the aircraft in order to take the video or image as input. A multiplexer is used to transmit data package encoded by the encoder. The ground is also able to demultiplex the input image or video stream packets into separate data packets and to determine the ratio of video to image.

**Potential Infringements:** Among the claims, the face tracking drone potentially infringes upon the following [4]:

1. A system for transmitting still images and a video feed to a remote location

2. The system of claim 1, further comprising displaying the real-time video stream.

3. The camera is mounted on an aircraft and the receiver is included in a ground station.

This patent assigned to AeroVironment, Inc is involved with real-time high-resolution video streaming to local devices from a surveillance aircraft. In our design, we used a similar method so that complex image processing can be handled by powerful local resources rather than by microcontroller on the drone which has less computational power. While the differences between the patent and our face tracking drone is that the design described in the patent has only part of the functionalities as ours. For the face tracking drone that we designed, except for transmitting the real-time video to the remote control station, it also sends the corresponding information back to the flight controller on the drone to control the movement of the drone. So that although the two projects are both designed to transmit real-time videos, the method of parsing data and the way of using the data are quite different, so the two applications are being used in different contexts.

2.2 Analysis of Patent 2

**Patent Title:** “Method and device for remote control of a drone, in particular a rotary-wing drone”

**Patent Filing Date:** September 14, 2011

**Abstract:** This patent assigned to Parrot SA is mainly concerned with automated control and manual control of a rotary-wing drone. The automated control is able to control the pose of the drone by generating responses from the gyros on the three axes. In addition, it also has a manual control mode. In this mode, the remote controller consists of a touch screen, on which the user would be able to control the movement of the drone using fingers. The transmission between the controller and the drone is through wireless means.

**Potential Infringements:** Among the claims, the face tracking drone potentially infringes upon the following [5]:

1. Remotely control a drone after analysis of the direction and/or the amplitude and/or the speed of the said movement relative to the initial position.

2. Method according to Claim 1, in which the said control command to be activated is a drone climb or descend command, when the direction of the said movement is mainly oriented upwards or downwards, respectively, relative to the direction of the image displayed.

3. Method according to Claim 1, in which the said control command to be activated is a command to rotate to the left or to the right about a yaw axis of the drone, when the direction of the said movement is mainly oriented to the left or to the right, respectively, relative to the direction of the image displayed.

The face tracking drone that we designed includes the functionality of remote control, which has been described in this patent. The two designs have the similarities in the remote control functionality that the drone would be able to have the movements including climbing, descending, rotating to the left and to the right about a yaw axis of the drone. While the differences of the two projects are obvious as well. First, the flight controller of the face tracking drone is adjusting the movement of the drone by reading the signals sent back from the remote control station, which is based on the face tracking information; Second, instead of using a touch screen, which requires human-eyes’ focus on the screen, we are using a pedal to let users to adjust the movement of the drone. So that although the two projects are aiming to realize the same functionality of controlling movement of the drone, the methods being used is quite different.

2.3 Analysis of Patent 3

**Patent Title:** “Drone delivery of coffee based on a cognitive state of an individual”

**Patent Filing Date:** June 22, 2017

**Abstract:** This patent is for the design of a drone that is responsible for delivering coffee or other types of drinks to a specific individual who have gestured that they would like the drink or for the person who is in a predetermined state that has been indicated by an electronic analysis of sensor data.

**Potential Infringements:** Among the claims, the face tracking drone potentially infringes upon the following [6]:

1.The UAV is fully autonomous, and flies to the area and flies to the individual without human assistance.

2. The electronic processing circuit is not on the UAV, and the UAV transmits sensor data wirelessly to the electronic processing circuit to identify the individual.

3.The electronic processor circuit uses image data of one or more of the people to determine an identity of an individual using a face recognition algorithm.

The patent has some similarities as our face tracking drone in the following ways: first, the two designs are both fully autonomous, that the drone is able to adjust its own movement based on the data transmitted wirelessly; Second, both systems utilizes a face recognition algorithm to recognize the person based on the image (or real-time video) data. But the main difference is, for the face tracking drone, the person who is being tracking is going to move randomly, so that the drone needs to keep moving, where great stability is needed, while the drone designed for delivering drinks can assume that the person is relatively stationary. Although the two designs seem similar, the purpose of them are quite different. For the delivery drone, it is designed to finish its task at the time when the drink is delivered, while for the face tracking drone, the main purpose of it is to shoot the video of the specific person, and face tracking is just a peripheral function.

3.0 Sources Cited:

[1] “Recreational Fliers & Modeler Community-Based Organizations,” FAA seal, 13-Feb-2019. [Online]. Available: https://www.faa.gov/uas/recreational\_fliers/. [Accessed: 21-Mar-2019].

[2] “Equipment Authorization – RF Device,” Federal Communications Commission, 20-Mar-2018. [Online]. Available: https://www.fcc.gov/oet/ea/rfdevice#block-menu-block-4. [Accessed: 21-Mar-2019].

[3] “Equipment Authorization Procedures,” Federal Communications Commission, 02-Apr-2018. [Online]. Available: https://www.fcc.gov/general/equipment-authorization-procedures. [Accessed: 21-Mar-2019].

[4] “US9288513B2 - System and method of high-resolution digital data image transmission,” Google Patents. [Online]. Available: https://patents.google.com/patent/US9288513?oq=“System and Method of High-resolution Digital Data Image Transmission.” [Accessed: 21-Mar-2019].

[5] “EP2364757B1 - Method and device for remote control of a drone, in particular a rotary-wing drone,” Google Patents. [Online]. Available: https://patents.google.com/patent/EP2364757B1/en?oq=Method and device for remote control of a drone, in particular a rotary-wing drone. [Accessed: 21-Mar-2019].

[6]“US20170174343A1 - Drone delivery of coffee based on a cognitive state of an individual,” Google Patents. [Online]. Available: https://patents.google.com/patent/US20170174343?oq=face tracking drone. [Accessed: 21-Mar-2019].