Oculus Drift

Oculus Rift Drone Operation

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Abstract. The purpose of this project is to create an interactive first person view in a goggle headset that will increase the usability of drone camera technology. The idea is that by associating the controls with natural movements we do on a day to day basis, more users can get more value and functionality from the services a drone camera can provide. The system will incorporate controls such as turning your head in order to the drone itself, thus making it seem as if you perspective is now the drone's. The benefit of this project is that many of the technologies needed are already in existence and readily available. Oculus Rift is a clear favorite in terms of the goggle set, as it is already an accomplished design and encourages incorporation with new systems. As far as drones go, either a specific model can be chosen for the project based on it's compatibility with our goals or a platform can be developed for a wider variety of drones on the market. The goal is to determine which option is optimal, and how to best incorporate it with the functionality of the Oculus Rift system.

Problem Description

The problem at hand is that the operation of a drone with camera can be difficult for the average person trying to accomplish a task. Arial maneuvering takes skill, and this is complicated by having to coordinate the screen, the controls, and the position of the drone all at once. In order for the project to be successful, the final result must be a system that incorporates intuitive controls with a visually appealing and comfortable headset. For this project, the main focus will be on determining which movement's users would like to access in order to control the perspective camera. This will likely require many rounds

of testing as well as several volunteers. If research indicates that choosing a specific drone model will more successful, a secondary focus will be devoted to finding the best type of camera mount and position. If research indicates the contrary, then the system will need to be able to accommodate a multitude preexisting drone systems.

Prototype Brainstorming

The likelihood is that a single drone model will be chosen, as it may not be feasible within the scope of the project to create an application that can more or less highjack any given drone's normal operating controls.

When considering how we can improve the controls of the drone, we must first take a look at the controls themselves and what we find to be insufficient. The first component to be considered is the controller. The drone can operate in a 3-dimentional space, having freedom in all three of the X, Y, and Z planes. This is accomplished by regulating the speed of the four (or more) blades. In a typical controller, there is a stick to control altitude, and then a second stick to control movement in the X and Y plane. This is different from the traditional airplane controller, but typical of newer quad-copters. Generally when operating in the X/Y plane, the drone must tilt to some degree. One common drone on the market, the Parrot AR drone, does not come with a controller but rather has an IPhone compatible app with virtual joysticks on the screen. This gives hope to being able to create our own hopefully virtual controller for cost effectiveness.

The second component to be considered in our case is the drone camera. Cameras are typically mounted in a crash safe area of the drone and vary from model to model. It is not unusual for them to have swivel capabilities separate from the drone itself, but often they are static and rely on the drone in order to regulate the perspective. Another thing to consider is that not all camera models provide and active feed; this will be a required feature in our project. The live feed is usually displayed to a screen on or near to the controller

If the swivel component were present, the logical option would be to simply have the Oculus rift control the axis of view (As the user looks up with the oculus rift, the camera swivels up). If the user wants to look outside the view of the swivel, the drone would then begin to turn in that direction in order to maintain the perspective. This issue will be covered more in the scenario in which the swivel is not present. In order to then control the drone, you would only need the X/Y/Z plane manipulation controls already present in a standard controller.

The other scenario is that the drone's camera does not come equipped with a swivel component. There are then two options, the first of which is to provide a mountable swivel component that uses the same approach as above. This is problematic though, as many of the cameras cannot be detached or the mount will not likely be able to mount on the drone. The second option is provide an alternate set of controls. As the user moves the head to left and right, the drone would compensate by swiveling to the intended direction. This could be difficult as changing aerial orientation require a lot of rock on the drone's axis, which could be a rather jarring visual. One then must consider movement in the Z plane; you cannot rotate a standard quad copter in this manner. The solution to this problem will have to be determined by user preferences in testing. It is possible as the user looks "up", then the drone could simply fly higher in order to respond to the user's desire to see something higher up. Another solution will hopefully be discovered as the project is researched and developed

When researching this project, several view apparatuses were found to already be in existence. What they lack is that the do not incorporate the users head movement, rather the just acted as a set of goggles that displayed directly what the camera had to offer. The Oculus Rift would provide several advantages not present in current models. As talked about above, it would incorporate intuitive human movements for easy control off the bat. Secondly, the system was designed and improved to create the view of a 3-D space rather than a 2-D screen. Although other technologies might attempt this, Oculus is publically recognized as having some of the best 3-D virtual technology on the market.

Expected Results

In this project, it is expected that we will determine the most desirable 1st person perspective in a 3-Dimensional environment. With that knowledge, we will then develop the best way to apply that to a drone and it's various controls. I expect that a swivel camera will be optimal, is it most closely resembles the movements of the human head. At the same time, I also expect the swivel camera will be hard to find on a drone and even harder to find on a drone that is compatible with Oculus rift controlling it.

Given that, I expect the target audience will be much small and specifically looking for this functionality. However, once the project gains traction, I imagine we can provide it at a lower cost to the public for a much wider variety of users and applications. Drones are expected to become a major part of our economy and culture within the next few years. Their moderate cost combined with their myriad of possible applications makes them a viable option for many businesses. As this technology becomes more advanced and widely used, it is safe to assume that good portion of society could benefit from the services they provide. This project will increase the usability of this technology by putting the user into a 3-D space they have control over.