Project Spearhead
Post Mortem - Control Variation

Note: The testing done by the Spearhead team is by no means scientific. We aren't researchers, we're game designers attempting to learn as much about a new device as possible in a 6 week crunch period. As a result much of our data is incomplete and many of our conclusions rely on anecdotal evidence. Please feel free to disagree with our conclusions or better yet, continue our testing and refine our methods and results.

Overview

The most interesting aspect of the Oculus, in our opinion, is it's use as a new form of controller. We believe that it's completely possible to create an entire game experience with the only needed peripheral being the Oculus Rift (no keyboard, no mouse, no gamepad) or to use the Oculus to augment and add additional mechanics to a game. In this same train of thought we wanted to explore the Oculus's usability in reference to several already established variations of control. Each of the tests in this category are taken directly from mechanics present in many current games. We want to see if they will translate to the Oculus. How adaptable is the Oculus? How much customization should game developers need to make available for the user to play with?

Test #1
Vertical Axis Inversion

Hypothesis:

Inverting the vertical axis will no longer be a viable option for video game controls with the Oculus.

Description:

The vertical axis will be inverted on the Oculus; when the user looks up, the in-game camera will look down and visa-versa. The horizontal axis will remain the same. The user will play through an obstacle course that requires them to look around to move in a direction. First, they will play through a course with the vertical axis set normally. Second, they will play through a similar course with the vertical axis inverted. The courses will be of equal length, and the times through the courses will be compared. Because of the difficulty of the end of the courses, the times recorded were taken at the very beginning of the final obstacle (the large barrel with two separate paths cut into it).

Results:

	Normal Controls				Inverted Controls			
	Time 2	Time 3	Average	Did they finish?	Time 2	Time 3	Average	Did they finish?
User 1	24.3	26.2	25.3	3 for 3	32.9	63.1	48.0	0 for 3

User 2	24.9	22.8	23.9	3 for 3	24.8	22.8	23.8	2 for 3
User 3	22.8	27.0	24.9	3 for 3	40.8	22.8	31.8	1 for 3
User 4	30.4	33.1	31.8	3 for 3	47.1	41.0	44.1	0 for 3
User 5	22.8	22.8	22.8	3 for 3	58.1	54.2	56.2	0 for 3
User 6	38.0	28.0	33.0	3 for 3	112.0	60.0	86.0	0 for 3
User 7	24.0	22.0	23.0	3 for 3	48.0	85.0	66.5	1 for 3
User 8	23.1	24.9	24.0	3 for 3	45.0	52.1	48.6	0 for 3
User 9	37.0	25.5	31.3	2 for 3	32.0	27.0	29.5	2 for 3
User 10	30.8	23.6	27.2	3 for 3	22.8	44.5	33.7	1 for 3
Average			26.7	29 for 30			46.8	7 for 30

Test #2
180 Degree Turn

Hypothesis:

Hot keying a 180 degree turn to the controller will continue to be a useful mechanic with the Oculus.

Description:

The user will use the space button to trigger a 180 degree turn. After the turn is complete they will need to use the Oculus to look at three shapes marked with either an A, B, or C. The time it takes them to find the shapes will be recorded and compared to a test done with a normal monitor and mouse input. The monitor version of the test will be conducted first. 5 trials of each version of the tests will be done.

Results:

	Monitor Trials			Oculus Trials		
	Average	Nausea?	Difficult?	Average	Nausea?	Difficult?
User 1	2.76	No	No	4.15	No	Yes, wanted to look with eyes, not turn head.
User 2	2.83	No	No	3.16	No	Mouse is Easier
User 3	2.84	No	No	3.26	Only when shaking head quickly	Don't find natural, mouse easier
User 4	3.43	Little bit	Difficult to control Mouse	3.11	No	Camera move was fine
User 5	2.73	No	No	3.39	No	Different feel than mouse
User 6	4.52	No	Yes	3.38	No	Yes
User 7	3.62	No	Yes	3.44	No	Yes
User 8	3.26	No	No	2.90	No	No

User 9	3.21	No	Mouse Sensitivity Annoying	3.26	No	Easier, felt it went quicker
User 10	2.83	No	No	3.35	No	More Convenient, better precision than mouse
User 11	3.08	No	No	3.39	No	No
	3.19			3.34		

The global average for the monitor trials was 3.19 seconds and the global average for the Oculus trials was 3.34 seconds.

Test #3
Orientation Sensitivity

Hypothesis:

Some users will find it useful to adjust the sensitivity of the Oculus in regards to its rotation tracking.

Description:

The user will need to use the Oculus to follow the path of a brightly colored ball. The ball will move rapidly around the user's character and pause for a period of time then begin moving again, this will continue for 15 secs. The amount of time the user spends looking at the ball will be recorded as a numbered score. This test will be done for a range of sensitivity settings and the results compared. Before each test the user will be allowed to play with the new setting and get used to it.

Results:

	Sensitivity .25	Sensitivity .5	Sensitivity 1	Sensitivity 2	Sensitivity 4
	Average	Average	Average	Average	Average
User 1	407.5	626.5	588	560	333.5
User 2	526	549.5	634.5	651	525.5
User 3	537	715.5	695	612	673
User 4	489	627	647.5	575.5	468.5
User 5	626.5	745	738	721	652
User 6	453	606.5	711	752.5	776
User 7	492	661.5	666	671	637
User 8	588	644.5	616	655	534
User 9	591	743	707	672	635
User 10	508.5	673.5	646.5	746.5	616.5

Green cells mark the sensitivity where the user performed the best on average.

Control Variation Tests Conclusion:

When you look at the Oculus Rift as a controller and not just as a new form of display the possibility for VR games increase exponentially. These three tests explored the possibilities and options that come with using the Oculus as a controller. The first test dealt with the possibility of inverting the Y-Axis on the Oculus so that whenever you tilt the device up, the camera in-game will look down and visa versa. We found that when dealing with inverted controls users took almost twice as long to get through ¾ of an obstacle course. The final part of the course was more difficult and as a result many of our users took 100s of seconds more to finish the course with inverted controls than with normal controls. Some users were unable to complete the entire course at all. The chief complaint was that the controls did not feel natural, the next biggest complaint was that inverting the controls meant that users had to look in the opposite direction from the one they were headed in. From our standpoint this made it clear that an inverted y-axis is not a viable option for the Oculus Rift. We did notice that as users played with the setting more and more they adapted to it, some members of Project Spearhead are able to run the course perfectly even with an inverted y-axis. This is not reflected in our data, but bears mentioning. Another thing to note is that we briefly tested inverting both the y and x axis's. While still not as usable as the normal controls the opinion of the members of Project Spearhead was that this set up was more usable than just inverting the y-axis. And while we do not recommend inverting the y-axis, inverting both could work in the right setting.

The 180 Degree test is reminiscent of a control that is common in console first person shooters, where a user can quickly turn their in game character around 180 degrees with a button press. Our test focused on the users' ability to find objects after completing the turn, simulating a scenario in which users might encounter during an FPS. We found that users were able to find the objects just 0.15 seconds faster with keyboard and mouse controls than they were with Oculus controls. We feel that this difference is negligible, especially considering that users were able to adjust the sensitivity of the mouse, but not of the Oculus (which was kept at a 1:1 ratio or sensitivity setting of 1 in terms of our 'Sensitivity Test'). Perhaps more importantly though, this test proved that camera moves that aren't controlled by the user are fine. This goes against just about everything that has been said by Oculus VR about in-game camera movements not controlled by the user. And while we aren't saying they are necessarily wrong (one or two of our users take issue with such movements), we think there isn't a need to cut the movements out complete, especially since we found them very useful in directing the user's attention.

The final test in our Control Variation Tests asked a simple question, do you need to offer sensitivity options for the Oculus Rift? Our test explored 5 different settings (.25, .5, 1, 2, and 4). For reference, .25 is where if you move your real head 40 degrees the in-game camera will move 10 degrees. We had users complete the same test 3 times with each sensitivity and the setting they were most successful with was recorded as the sensitivity they preferred. The standard sensitivity, 1:1 or 1 was only preferred by one user. The two most popular settings were .5 and 2 at 4 users each. To us this means that users need to make their own choice in regards to the sensitivity of the Oculus. This has also been reflected in our prototyping. There are times when it is beneficial to have the Oculus respond with more or less sensitivity than

‘normal’. One of the biggest reasons for purposefully adjusting the sensitivity of the Oculus is to reduce strain on the neck. If a game mechanic requires the user to continuously move their neck the sensitivity of the Oculus can be increased to give the user better control.