Oculus Rift Planetarium Project Diary updated 13/1/15

Start: 30/9/14 End: 31/3/15 Amount: £9,150

Timeline:

22/9/14	Budget code approved; 3x Oculus Rift Development Kit 2s ordered (£875.23)
23/10/14	Oculus Rift DK2 kits arrive; initial testing begins
11/12/14	ORPP Host machine hardware ordered (£1481.19)
22/12/14	ORPP Host assembled

Remaing budget: £6793.58

Project outline:
A pathfinder project designed to find/adapt/develop planetarium software to make use of the Oculus Rift VR headset, primarily aimed at stargazing tours and educational use. Key goals are:

1. Assess the current state of readiness of the hardware and existing planetarium software
2. To achieve a comfortable/enjoyable single-user experience
3. If successful, determine how to further adapt software for a multi-user experience
4. Achieve a stable multi-user experience with host/nodes connected via internet
5. Make our findings/software available for others

Host machine hardware specs:
Intel i7-4900K processor; 16GB RAM; 500Gb SSD; Nvidia GTX 970 graphics

Results from initial testing:
The headset resolution is not high enough to provide a full HD experience but the head-tracking capabilities are very powerful. Some large-scale, fully-funded games such as the older Half-Life 2 and brand-new Elite: Dangerous already have built-in DK2 functionality. With the audio provided via a headset the games are incredibly immersive but also tax the graphics hardware meaning older machines will not be capable of running the Rift without frame-rate issues.

Another thing worthy of consideration is that some experiences induce significant motion sickness. These are most likely to be games where rapid camera movement is either out of the users control or there is a lack of a stable 'horizon'. For example, Elite: Dangerous suffers less from this problem as the user is in a cockpit with a visible distant star-field which provides a frame of reference whereas in Half-Life 2 the fast-paced first-person combat is often in much more confined environments.

The hardware issue is likely to be less of a problem with planetarium software as it is possible to achieve high frame-rates in these programs with a minimal hardware setup. Of course, this will be largely dependent on how ambitious the software tries to be. Stellarium is a very good example of the minimalist approach, by default the camera is fixed to the surface of the Earth which also lessens the worry of inducing motion-sickness.

Thinking ahead:
For the ORPP, the first thing to determine is whether or not we can achieve the simplest of experiences: that of a single, fixed-position observer who is free to look around under a simulated night sky. So far, we have been unable to discover a planetarium package that has successfully integrated the Oculus Rift for this purpose. The World Wide Telescope claims to have achieved this but so far cannot get it to work with our test equipment and the application itself is perhaps over-ambitious. A small start-up project termed 'Horoscoper' appears to have been successful but is not

yet available for testing, we can only try to get in touch with the developers directly. Stellarium, thanks to its open-source platform, simplicity and excellent 2D experience is potentially our front-runner for the ORPP. We have now made contact with one of the developers and hope to hear more soon, especially with regards to their early testing for the Oculus.

With progress on the single-user experience we cast our eyes further forward to consider how we might hope to turn this in to a multi-user stargazing 'tour' experience. Part of the fun of real stargazing tours is that you are being instructed by an expert and sharing this experience with the others in the group. In principle it should be possible to have a 'host' machine running the planetarium software. Any user who wishes to participate could run their own simulation on their local machine but connect to the telemetry/audio sent by the host. For example, the tour guide may wish to turn on the constellation lines and this signal would then propagate to the other machines. This could in principle happen via the internet though could equally work with locally networked machines.

In early discussions we considered using a single high-spec machine to run multiple simulations/headsets simultaneously for group visits to the observatory but this now seems impractical, due principally to the fact that the SDK makes no easy provision for using more than one headset on the same machine and also due to the extra cabling/connectors required and lack of portability. For now, small form-factor machines, one per headset, would seem the most sensible choice for running on-site experiences.

Other luxuries such as the ability to increase the size of an object on the sky, ie Jupiter, might be necessary as the traditional 'zoom-to-target' method in planetarium software will not work well in groups. Also, finding a way of attracting a users attention to the object of interest if they happen to be looking in the wrong direction may prove useful. More basic questions such as 'do the stars look right?' will have to wait until the successful integration of headset functionality.