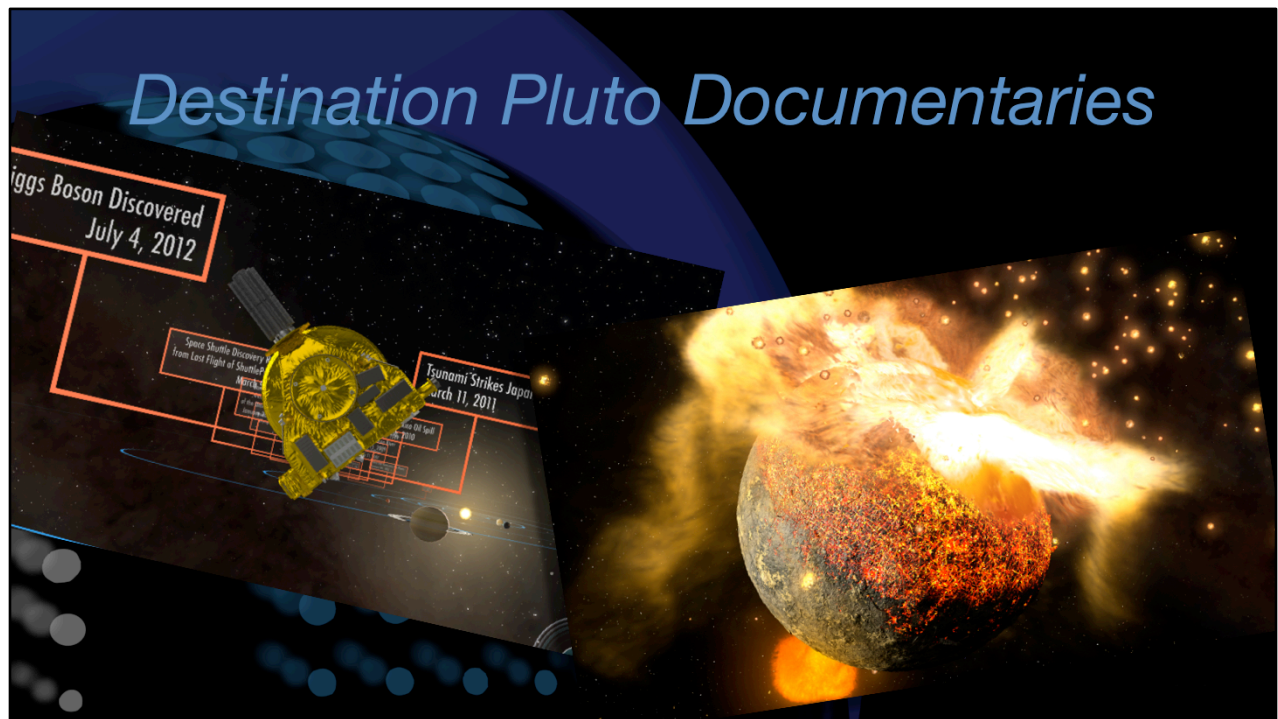




Hi... Most of you know my studio, Home Run Pictures, as a long-time producer of fulldome content... but we also have been creating content for educational documentaries even longer. A while back we bought an Oculus and a VIVE to experiment with and see how VR fit into what we were doing for our various educational oriented clients...



One of our clients, CuriosityStream... is an online streaming site created by the founder of The Discovery Channel... basically a Hulu/Netflix style site for members who, when paying a small monthly fee, can stream lots of science documentaries.... They also hold science conferences where speakers are invited to talk about their various scientific disciplines..



Last Spring, we were working with LA Producer, Dana Berry at Sky Works Digital on a series of mini documentaries about the NASA New Horizon mission to Pluto... we were providing various animations... things like a timeline showing the events that occurred during the spacecraft's nine year trip to Pluto... how scientists theorize the Pluto/Charon system was created by a massive collision similar to how our own Moon was formed... and flyovers of what the Pluto surface terrain might look like...

Destination: Pluto VR360

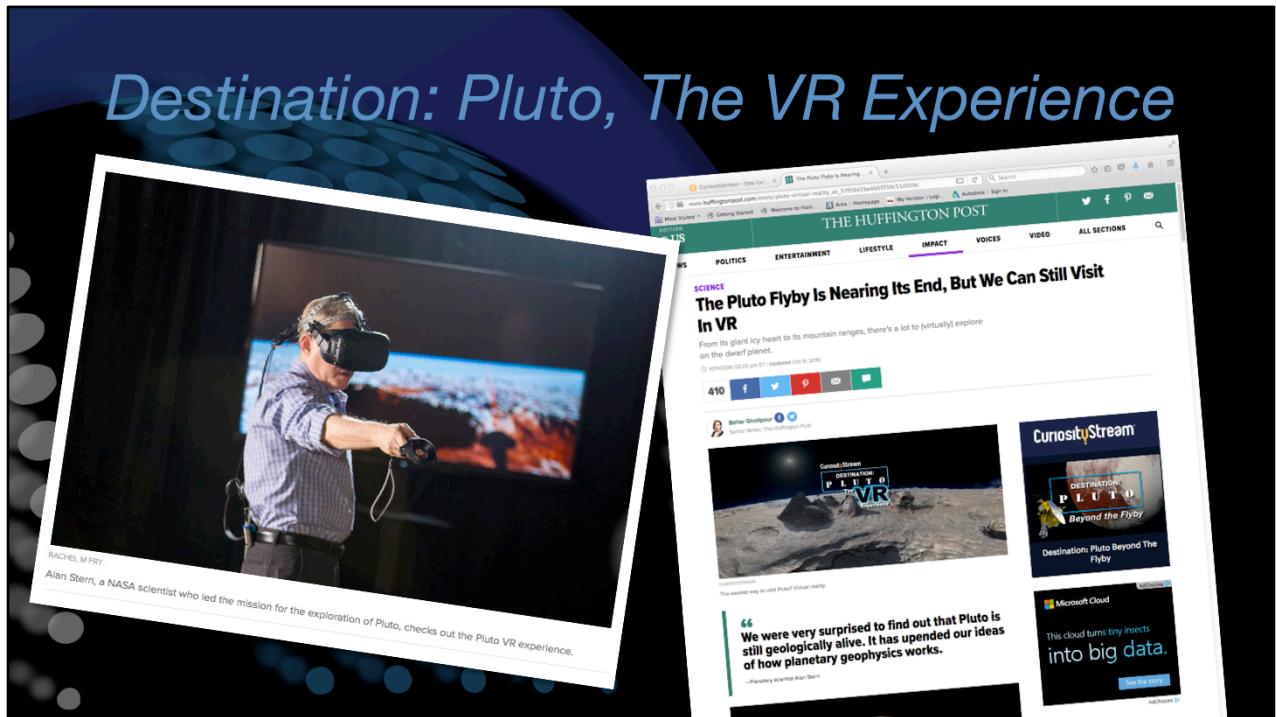


Now the last documentary in the series occurred about the time the spacecraft flew past Pluto and imagery was just beginning to be sent back... we were asked to create a few “look around VR” scenes of different geological areas using Goggle cardboard viewers... They were very impressed with the result... so, just in jest, we suggested they might want to take it one step further and develop a six axis VR experience using the HTC VIVE...

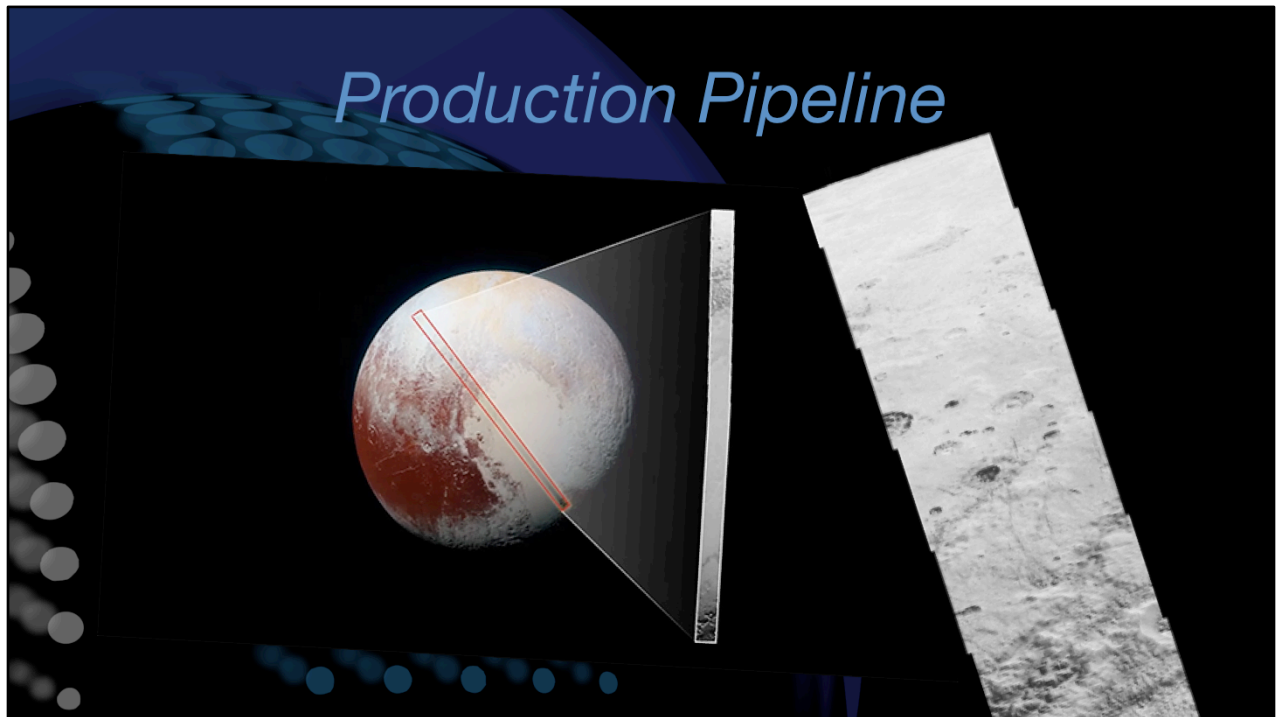


They realized that it would be a great idea to use as an attraction at their upcoming Curiosity Science Conference where NASA New Horizon director, Alan Stern would be one of the speakers... so the Destination: Pluto, The VR Experience was born...

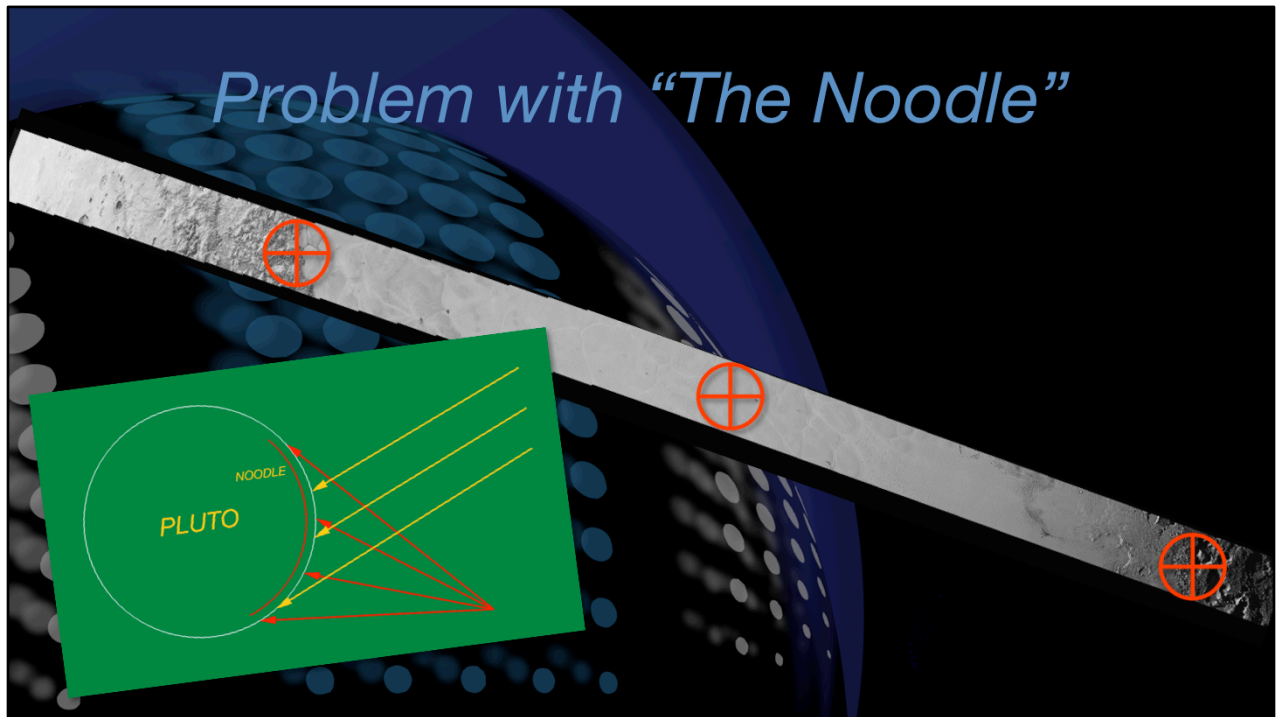
Destination: Pluto, The VR Experience



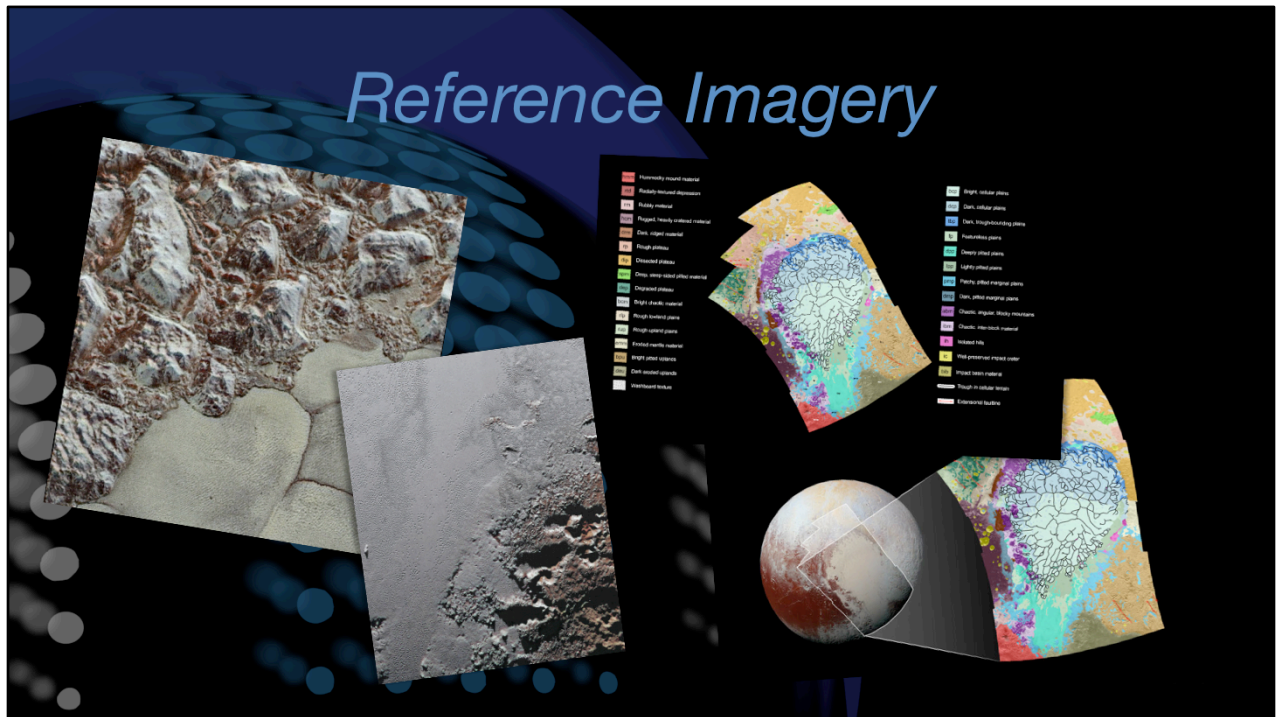
At the conference , the VR simulation was a huge success with lots of positive response... pictured here we have NASA's Alan Stern checking out the Pluto VR Experience... and a very nice article describing the VR at the Huffington Post site... I like the headline...



So let me talk a little about the production pipeline we developed to create the simulation... we were asked by the client if we could use a mosaic of images that a NASA scientist had assembled as our base... these are the best resolution images because of the spacecraft's flyby path... and it's nicknamed "the noodle"... it was a challenging request since we were expecting to just create a few smaller areas to visit in the simulation...

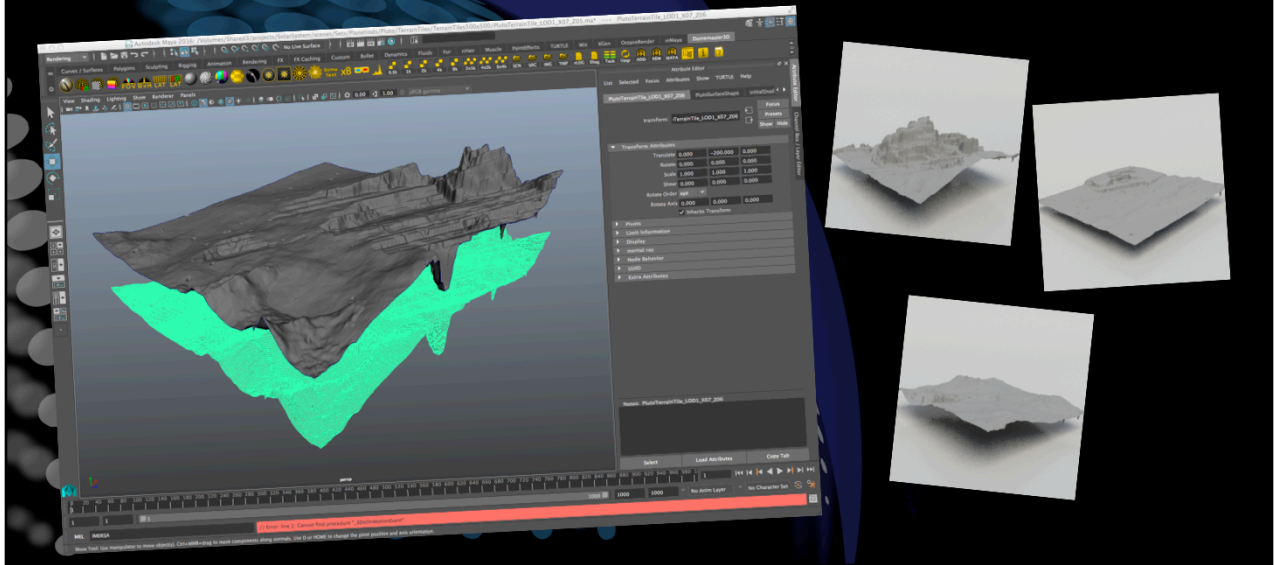


Of course you always say yes to the client, but we immediately saw a problem... since there was no elevation data available, all that we had was this long image... first, in reality, was made from images of various resolution and detail due to the different distances they were taken from... and second, if you look at the little diagram on the left, you will see that since the strip's imagery actually curves around Pluto's rim, the perspective in the photo is not flat on... and the sunlight striking the terrain along the strip is coming from an ever changing angle... this creates shadows of differing lengths depending on where you are... so what do you use to determine how high the features are...

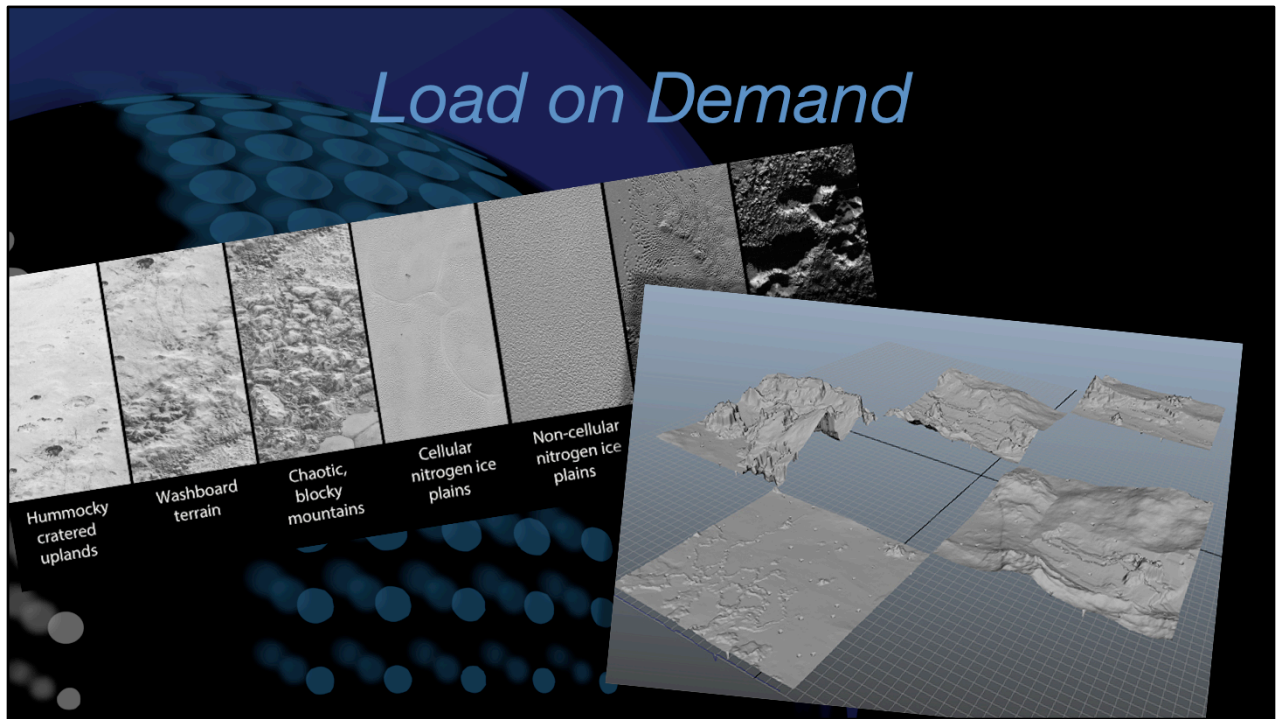


The terrain would require some tricky decisions for our modelers to get the fairly accurate meshes we needed... more imagery to reference from was coming in daily that would help... but to get the process started, we came up with an approach to subdivide the noodle into smaller patches and apply some geometric concepts individually based on shadow length... also the texturing of the surface required some special scripting to develop specific, shall we say, brushes, that our artists would use to create the geological features and coloration that NASA was discovering...

Mudbox, 3DCoat, Maya, Unity



There were three main areas that were created that represent different geological formations... we used Mudbox to initially sculpt the meshes, then imported those into 3DCoat for continued reworking and texturing, and then finally Maya to assemble all the patches as one long mesh to import into Unity...



The mesh was huge... much larger than what even the high-end graphic cards we were using with the VIVE are designed to handle all at once... Using the Unity game engine, we came up with several "load on demand" scripts that used lower resolution patches off in the distance which then only loaded the higher resolution information when you got closer... as we continue development, we are trying various other compression and optimization schemes to improve the performance...

Programming

PLUTO VR EXPERIENCE
REVISIONS FOR V-3
November 21, 2016

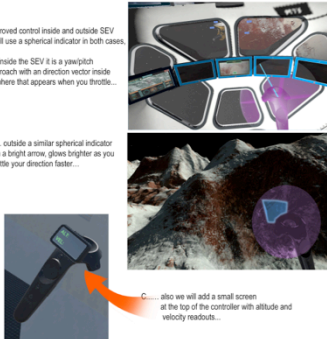
1. The request: -Control Improvement: Some visual feedback when the joystick/trajectory is engaged. Perhaps it changes color when the button is pressed, or it starts to glow. Something along those lines that can inform the user that the altitude is changing and the joystick is working. Basically a visual indication of movement. Is it also possible to make the arrow a little bigger as well?

Improved control inside and outside SEV... will use a spherical indicator in both cases.

A. inside the SEV it is a yawpitch approach with a direction vector inside a sphere that appears when you throttle...

B. outside a similar spherical indicator with a bright arrow, glows brighter as you throttle your direction faster...

C. ... also we will add a small screen at the top of the controller with altitude and velocity readouts...



Contact: Dane Berry, 310-890-0161, danberry@xrl.com

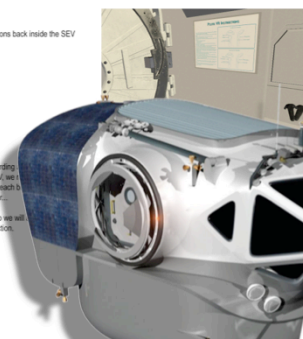
PLUTO VR EXPERIENCE
REVISIONS FOR V-3
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2. The request: Instructions: Any chance that we could have the instructions back inside the ship. I believe it was a poster before? Also, could we assign a button when we're outside of the spaceship that would trigger the instructions as a panel on the surface? A way for the user to remember the control functions when they are not inside the ship, or perhaps a "help" button.

A. Directions back inside the SEV

B. ... Repeating of the SEV user labels for each of the buttons...

C. ... also we will SEV functions



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PLUTO VR EXPERIENCE
REVISIONS FOR V-3
November 21, 2016

3. The request: -Inside the ship, can we change the spacing parameters so that the user doesn't have to walk right up to the location selection screens? We love how it's set-up, Peter was just hoping that the screens could possibly be activated from a little bit further back.

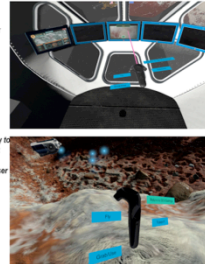
A. Instead of having to move up close to the monitors and touch them, we will add an additional laser pointer function similar to the teleport function when you are walking around on the surface...

4. The request: Is there any way to assign a button that will take you back to the ship, or next to it, while on the surface? The thought being that the user may not easily find how to return to the ship.

Return to SEV button will be obvious and usable when walking

The request: Sound design & Credits - Perhaps some ambient music or sfx? Maybe sfx for the hatch or the hatch. If you add to this note, if we do go with ambient music, it may be nice to be able to turn it on and off.

Yes to more sound, and yes to add a mute button to the sound. As for music, we'll send over loop samples from which to choose. As for credits, yes, we will put credits in.



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The "home" position in the VR is inside the NASA Space Exploration Vehicle or SEV... the VR loads placing the explorer in the spacecraft and the computer screens in the craft are used to navigate to the various areas in the simulation... the VIVE wands are used to select various options and fly the craft...



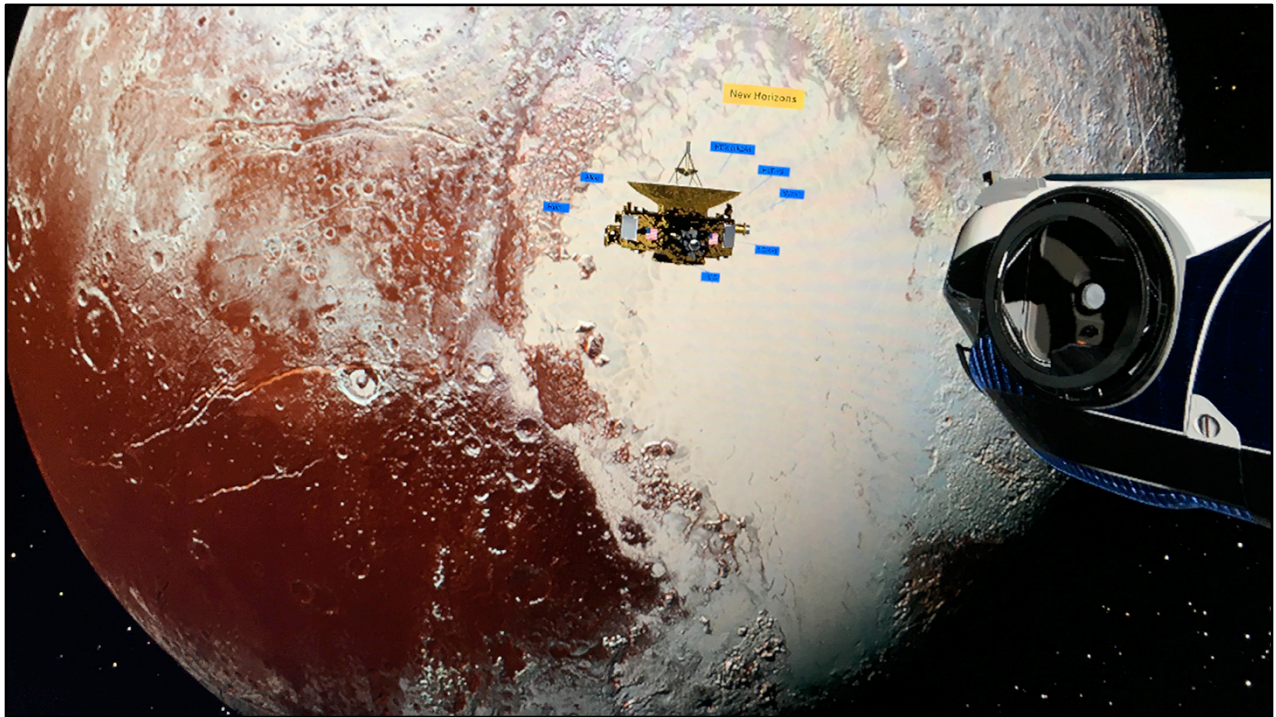
Here we are inside the SEV looking out the front windows at one of the the terrain locations...



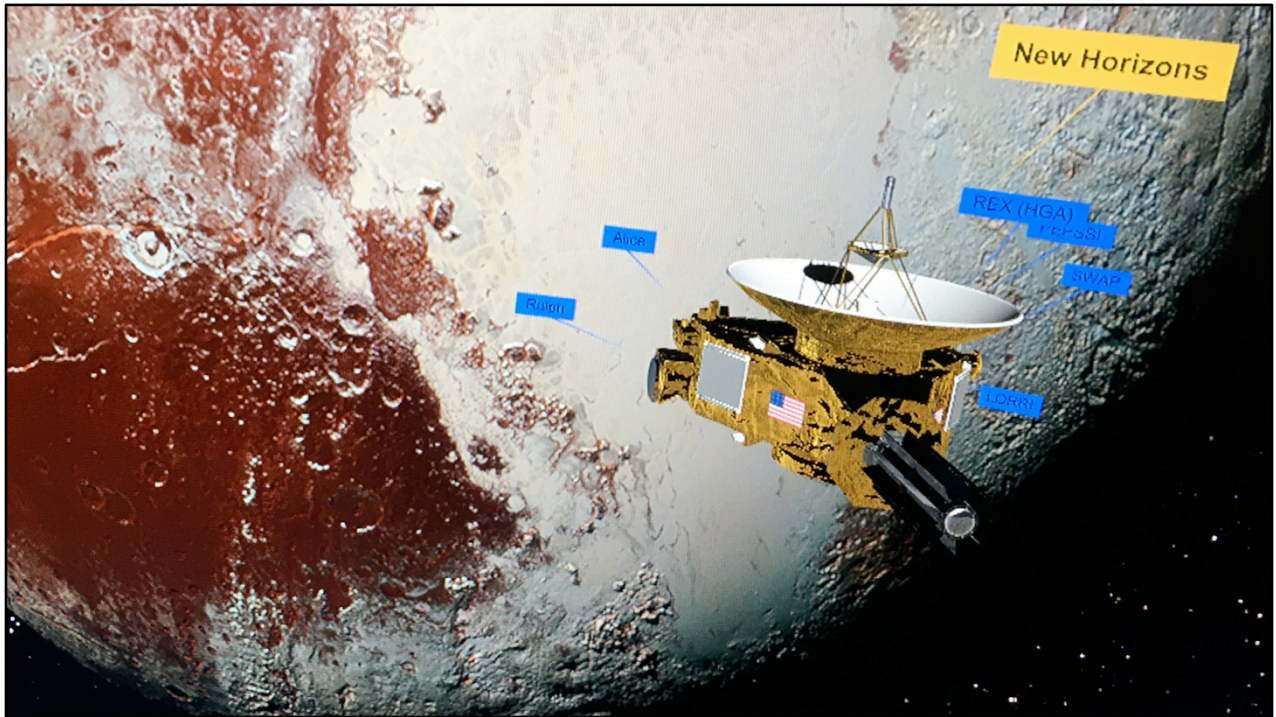
At startup you are near the New Horizon spacecraft as it flies past Pluto... here we are looking out a window of the SEV...



A pop-up panel is used to select options... there is a selection for the scale of the terrain, from real-human-scale to where the terrain is scaled down... obviously real-human-scale requires more effort from the graphics card... by touching the docking port door and squeezing the wand, you can go outside...



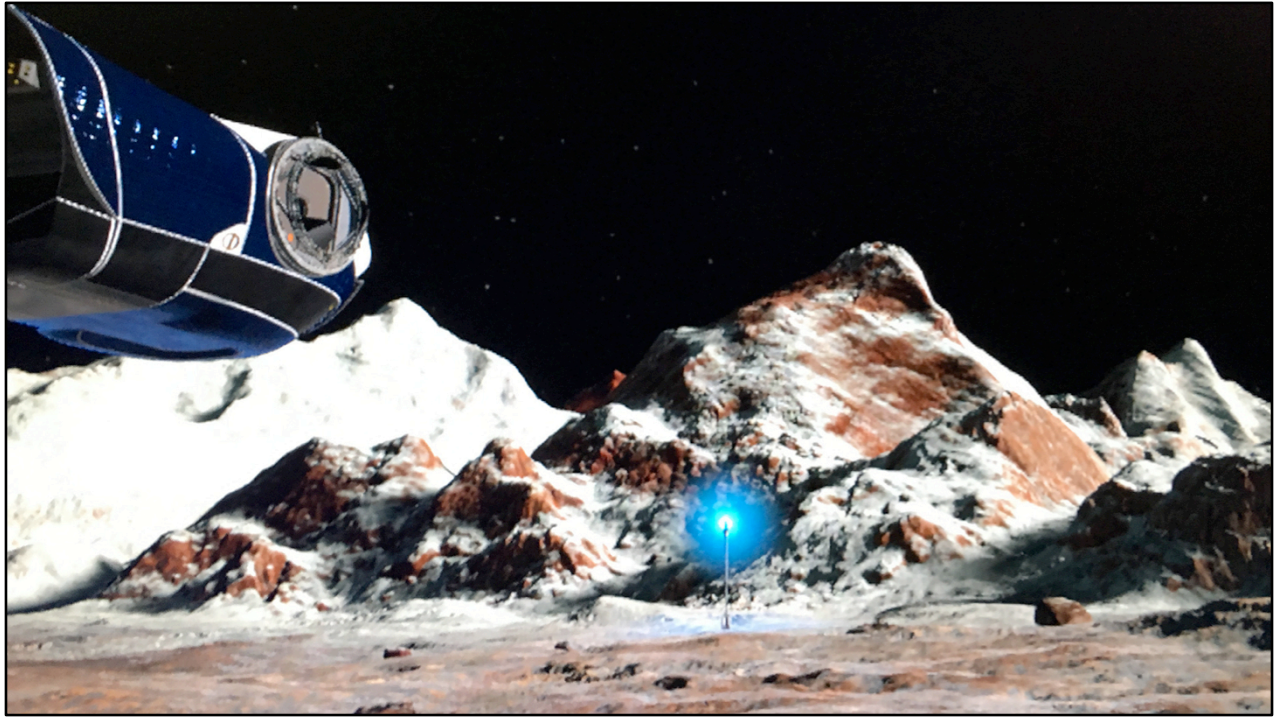
Once outside you maneuver and fly around using the wands...



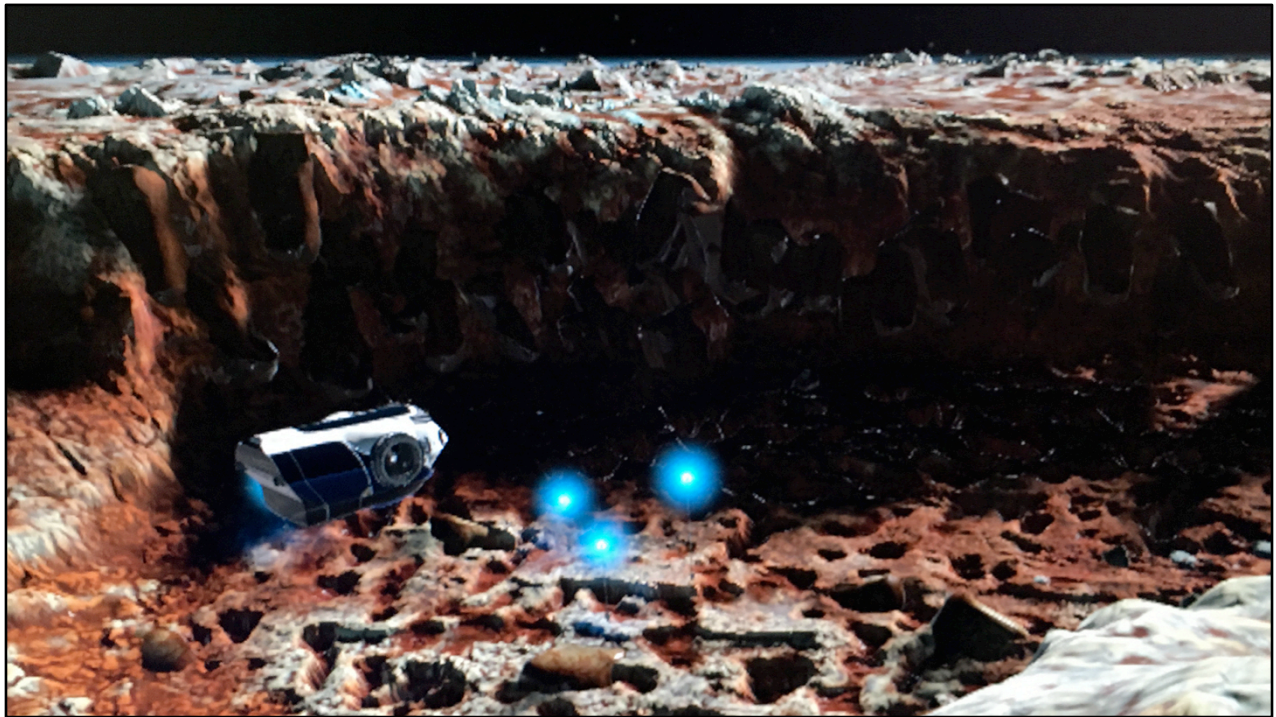
Keeping with the educational purpose of the simulation, there are label tags that pop up describing various things you encounter...



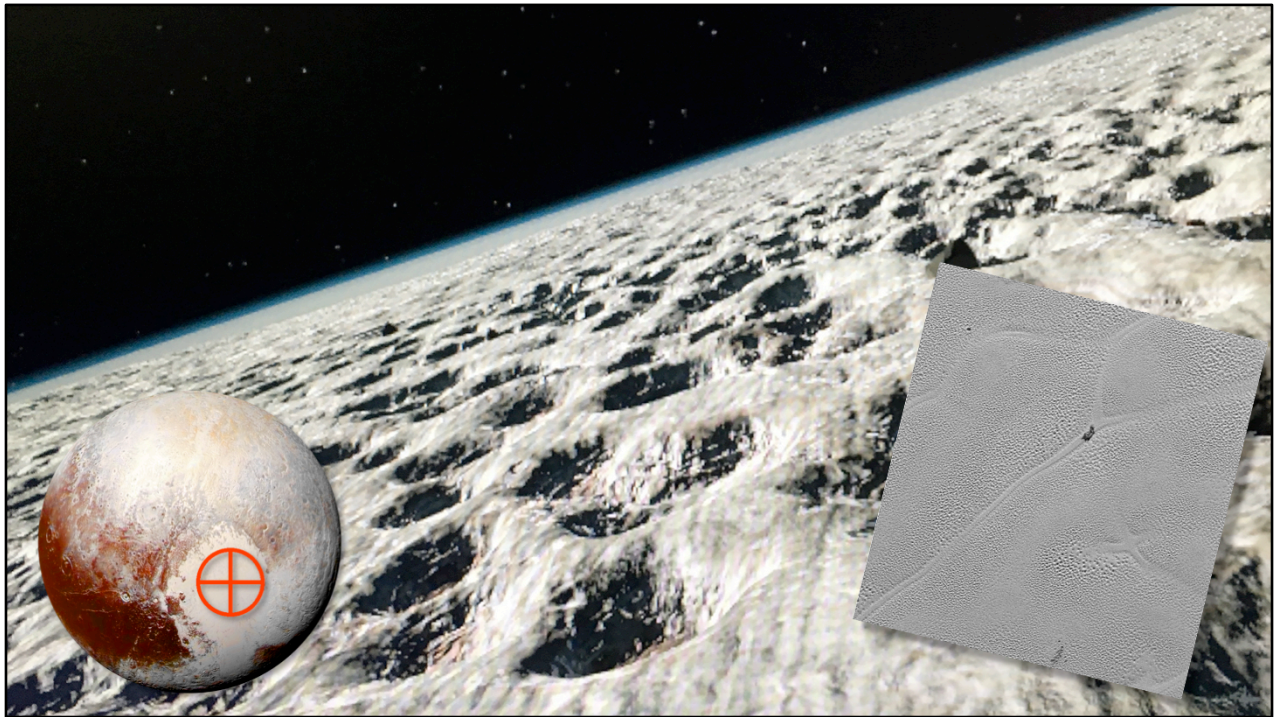
When you select to be transported to the three different surface areas, you can fly around in the SEV... or you can get out and walk around...since the volume of the VIVE is only about a 5 meter cube, you can point a wand and “teleport” to locations further away... or also fly around like you have a jet pack on...



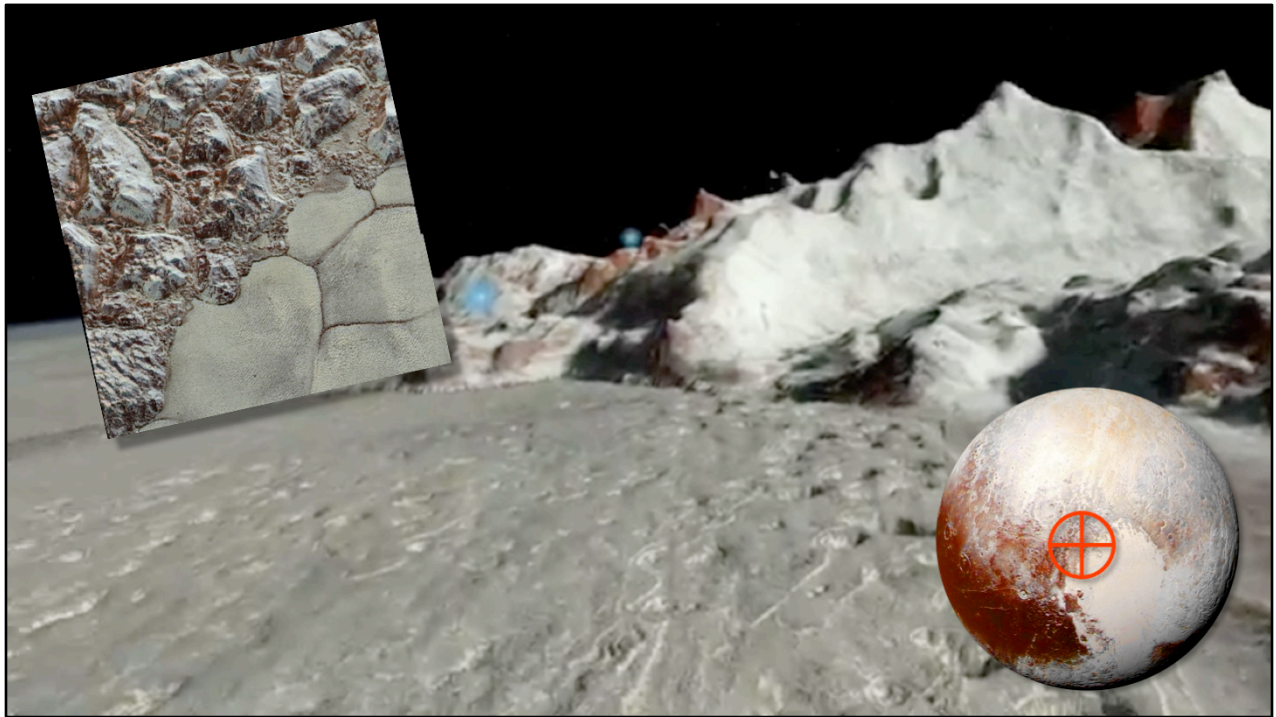
The blue beacons scattered around the terrain turn into museum style placards and explain points of interest when you get near...



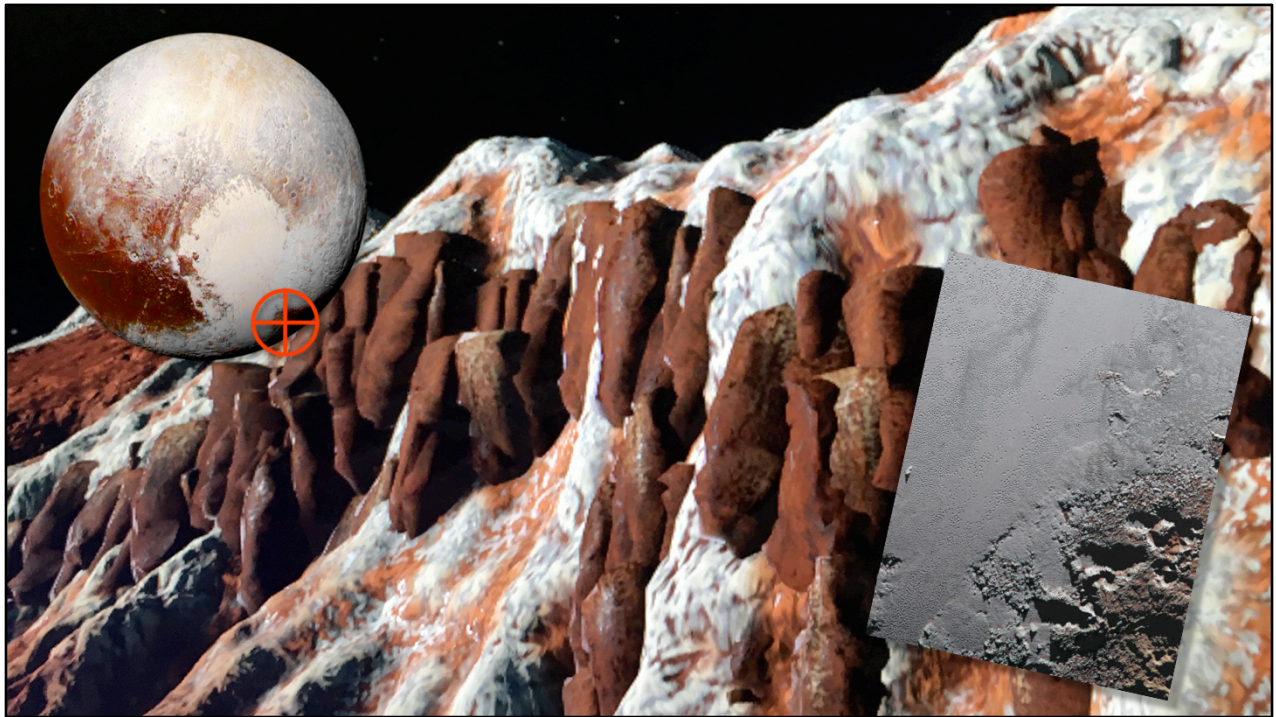
And of course in some area, like here in the twilight canyon of Krun Macula, there are rocks you can pick up and throw quite long distances as the low gravity on Pluto is properly simulated...



As I said the three areas you can visit are different types of geological formations... here we are above a frozen nitrogen glacier called Sputnik Planum... a reference image is on the right... the pits are caused by ice sublimating and range in size from small cars to large houses...it's the heart shaped area you see in the full hemisphere images of Pluto...



This is a mountainous region I can't pronounce... something like Al Ee-DREE-see
MON-tez... it's the north shore of the heart-shaped glacier I mentioned...



This is an area called Krun Macula... filled with canyons made up of different colored ice formations... red is methane ice, white is either water or nitrogen ice...



And here's a short demo video...

If you have a VIVE... Destination: Pluto, The VR Experience, in its current version is available for download at the online Steam site... and it's free... you can also find more information at the Home Run Pictures VR site... Questions?