Explication techno ZSpace

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CONTEXTE :

Pour le contexte prendre la note de cadrage des stagiaires + dossier architecture

PRINCIPE DU ZSPACE

zSpace is a mixed reality hardware and software platform that enables developers and users to interact with computer-generated objects in a three-dimensional (3D) holographic-like environment, often likened to virtual reality (VR) or augmented reality (AR). (in reality mostly VR)
However, the biggest difference with a mixed reality zSpace experience is that it lives comfortably on your desktop, and does not require the user to wear any electronics or heavy displays.
For all of this to work, the tracking of the viewer's eyes, the generation of unique stereoscopic perspectives, the recreation of real world dimensions, and the display timing must be perfectly in sync with each other.

Space is, at its core, an orthographic stereoscopic experience. Orthographic in this context refers to the link between the physical space and virtual space, presenting objects as if they are sharing the same world space as the viewer. zSpace is designed to make this illusion as believable as possible. Anything that breaks the orthographic stereoscopic experience also breaks the illusion of three dimensional reality.

DISPLAY

At a software level, discussed later, the output buffer is equivalent to a single stereoscopic image, and it is the GPU's responsibility to ensure this stereoscopic image buffer is properly converted to 120 Hz with alternating left and right eye image metadata.

zSpace displays also work as normal monoscopic displays. Most zSpace applications automatically switch from mono to stereoscopic upon detection of glasses or stylus.

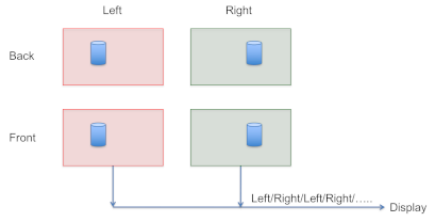
Fonctionne un peu plus comme UN FISH TANK + QUE DE LA VR (et complétement diff d'un HDM d'ailleurs)

UTILISE DES RENDERING BUFFERS

In standard 3D applications, there is a single back buffer and single front buffer. In stereo rendering, there are two back buffers and two front buffers - one for each eye.

For HDM's: HMD stereo rendering configures one large back buffer and virtually divides it in half during rendering. The left half is the left eye image, and the right half is the right eye image. It is configured this way because HMDs actually display one continuous buffer simultaneously. The system then uses lenses to focus on the buffer assigned to each eye.

For QUAD BUFFER stereo : le GPU affichr au final 4 imgs dont aucune n'est corrélés (pas de back and front together)



COORDINATE SYSTEM

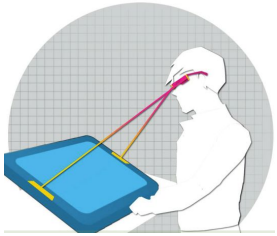
The zSpace system uses coordinate systems for head tracking and stylus tracking. Head tracking is transparent to developers. Stylus tracking requires an understanding of coordinate spaces to enable visualization and use.

Transforms : There are two transforms that zSpace calculates that get integrated into the rendering transforms of the Unity system. Both transforms are unique to each eye and need to be applied appropriately when rendering an eye.

zSpace takes the head pose, which represents the position and orientation of the center of the glasses, and calculates the two transforms appropriate for the stereo frustum. The view matrix transform represents the relative transform which combines the interpupillary distance, offset from the glasses to the eye, and the transform from camera space to display space.

Camera : The distance from the virtual camera to the screen can be calculated by using the zSpace

COMMENT FONCTIONNE LA VUE :



PRINCIPE :
You experience stereoscopic vision in the zSpace display much like in the real world. The zSpace system displays offset images for the left and right eye. The zSpace system includes passive polarized glasses to ensure that each eye only sees a single image. Your brain fuses the images together, producing a single stereoscopic 3D image.
CAD:
On a les capteur IR sur les côtés de l'écran détectent où sont les lunettes dans l'espace et en fonction l'écran affiche des images légèrement différentes (1 par œil, qui s'affichent rapidement à la suite sur l'écran en 2D (120Hz)). Ce sont les lunettes qui avec la polarisations n'affichent que l'une ou l'autre pour avoir l'effet 3d.

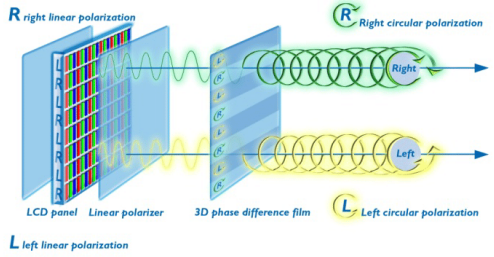
COMMENT FONCTIONNE:
The human visual system is not composed of a single camera. Humans see using two cameras (eyes), which generate two images that are fused into a single image by the brain. This is how we perceive depth. As a developer, we will use this processing in the brain to simulate the perception of depth in 3D applications. This is the basis for all stereoscopic 3D applications.
To simulate what happens in the human visual system, we use two frustums instead of one.

ZONE DE CONFORT :
L'espace pour afficher des images est segmenté en plusieurs zones, nous travaille sur la zone de confort (comme un écran) et si veut afficher un truc en 3D alors : The decoupled zone can be used for bold 3D effects of short duration (too long = eyestrain); If the viewer does not control the depth of an application, then the comfort zone should be the primary target and extreme 3D can be used sparingly as needed.

EXPLICATION HEADSET HEAD TRACKING:
Head tracking means that when you wear a VR headset, the picture in front of you shifts as you look up, down and side to side or angle your head. A system called 6DoF (six degrees of freedom) plots your head in terms of your X, Y and Z axis to measure head movements forward and backwards, side to side and shoulder to shoulder, otherwise known as pitch, yaw and roll.
>> From a developer's standpoint, this means that the frustum changes with every frame.

HOW TO DO STEREOSCOPY:
>> The left and right images are displayed alternately at up to 60 frames per second (fps) per eye or 120fps combined. As each left or right image is displayed, the screen alternately polarizes the light so that the left image can only be seen through the left polarized lens of the glasses and the right image can only be seen through the right polarized lens of the glasses
>> donc en gros chaque œil voit 60 images secondes donc le pc doit en faire 120

STEREOSCOPY PASSIVE
Les images à droites et à gauches sont sur imprimées sur l'écran avec l'aide de filtres polarisés circulairement :



https://www.researchgate.net/figure/Principle-of-polarization-based-stereoscopic-3D-displays_fig1_251879462

Passive stereo – the left and right images are presented to the user at the same time. In front of the source of each image (i.e. beamer) a light polarization filter is placed with different polarization direction. For

camera offset and display angle. You need to know this distance in order to position an object at or near zero parallax.

NATIVE PROGRAMMING

Building or porting an application to the zSpace platform at its lowest level of integration involves two distinct parts. First, the application must be stereo enabled and use the zSpace stereoscopic values to generate correct head tracked images. Second, the application needs to get stylus information into a coordinate system.

Que en C ou language compatible au C, pyhton??

EDITOR UI
The primary tool for getting data about zSpace execution is the inspector pane for the zCore object.

INTERACTIONS AVEC AIO:
Mouse : Although the stylus is a natural tool for zSpace, the mouse may be better in some situations. For example, if you are porting an existing application into the zSpace system and your users have a lot of muscle memory associated with the mouse, it might make sense for the mouse to emulate the stylus. A zSpace mouse plugin displays content in a stereoscopic 3D viewport. The mouse pointer is displayed in stereoscopic 3D within the viewport and appears as a standard 2D mouse over the rest of the user interface. There is no stylus beam, so a Z coordinate helps the mouse pointer move at different depths.

example with horizontal polarization for the left and vertical polarization for the right image. The viewer wears respectively polarized glasses (called passive glasses) so that the horizontally polarized light coming from the source of the left image can only pass through the also horizontally polarized glass in front of the left eye and not through the vertically polarized glass in front of the right one

LES LUNETTES :
Lunettes de tracking sont passive car elles sont polarisés différement d'un œil à l'autre.
AQ les bleues:
Les deux verres ont la meme polarisarion qui correspond à celle de l'œil gauche, cela permet de voir correctement UNE image (omme sur un ecran classique sans 3d) et sans avoir les 2 images en meme temps donc voit net !!

Pas vraiment en meme temps 'à 60 fps chacune,
Donc pour que notre cerveau fasse la diff il faut
Polariser les img qui arrivent