

## How inference help Virtual Reality to sustain illusions

Everyone makes inferences, and sometimes we don't even notice that. Our brain does this work for us, making inferences about everything we see, hear, smell, taste and touch. Every single nerve impulse from our sensory organs is used to make an inference. This inference is something that we make on the basis of our model of the world is what we refer to as reality. It is what makes VR different and powerful from anything that has come before.

### Let us take an example how our inference generates illusions

In the image below please look at the tile under the table and the tiles placed left and right to it.



The tile under the desk appears white in colour while those outside it appear to be black.

If everything else is masked out



Surprising, isn't it? They are all just the same shade of grey

This is the inference we made without even noticing. If one tile is of that shade of grey and is in shadow it must be white and if another one is in light and is still that shade of grey it must be black.

Our visual system does the inference for us automatically and what you see is black and white rather than grey.

The visual input from the above picture gets inferred on the basis of what we have seen in our daily lives, making a reasonable assumption that happens to be wrong.

If our inference doesn't match any reasonable model of reality, we will end up seeing something impossible.

We have numerous senses but our brains tend to rely more on vision than on any other sense. Sometimes our visual input overrides other sensory inputs creating illusions.

If the sensor coupled stimuli matches our brain's expectation of what is going to happen the next moment, simulated reality will get perceived as the real one.

As virtual reality is an illusion in which our brain makes a perception of space. To understand it better it is important to know **How does our brain make a perception of space?**

To perceive a 2D image as a 3D space, we will need to begin by building something into our environment called **stereoscopic vision**, the ability of the brain to sense a 3Dimensional shape from visual inputs.

Headset devices use stereoscopic display to make what you see three dimensional and to give depth to the image you are looking at. However, stereoscopic display does not make an experience immersive.

The difference between looking at an image of a place and being at that place is only that the stimuli vary with change in your movement. To put it simply if we rotate our neck to look towards right the visual input (scenery in front of us) changes.

Because we look around while exploring a new place, we need to implement the idea of **head and eye tracking**.

Head-tracking simply monitors the direction that your head is pointing by using a sensor called an **accelerometer** which can sense whether something is moving.

Head and eye tracking technique allows your headset to change the image being displayed with your perspective so if you turn around the display will render everything that is behind you in the environment.

VR headsets simulate binocular vision by presenting slightly different images to each eye, giving the illusion that a two-dimensional picture is a three-dimensional environment.

As our left and right eyes are on different sides of our face, they see things from slightly different viewpoints. The two different images from each eye are merged together into one in our brain by a process called stereopsis giving us a binocular vision. Binocular vision helps us determine how close or far an object is from us. Stereopsis is what will create the illusion of being in the picture instead of just looking at it.

An optical illusion can give rise to multiple illusions like

Place illusion - been transported to a new location

Plausibility illusion - assuming that the event occurring is real

Embodiment illusion - substitution of bodies with avatars

VR illusions are driven by the neurological mechanisms of everyday perception of the body in the world that makes participants often exhibit realistic responses to VR.

All the sensations come together through perception to give us the experience. This interplay of sensation and perception creates the experience of reality.