Abstract

Life on Earth has many forms and every life form has its own version of reality, as reflected in the eyes of the viewer. These worlds are as real as the one that we know and all of them are equally fascinating. The multiverse of such “animal realities” can be explored in Virtual Reality, as described in this concept work.


Keywords: alternative reality, animal vision, immersive exhibits

From Virtual to Alternative Realities

Virtual Reality (VR) is an umbrella term for technologies that provide interactive experience with artificially created environments. Using high-fidelity content and hardware, VR systems are capable of delivering a strong sense of presence, or sense of being there. It is normally implied that the virtual presence is created for and experienced by a human being. While the latter is always true (all known VR users are humans), the former leaves much room for experimentation. Specifically, VR systems can be designed to present the content as it might be perceived by other creatures: birds, animals, insects, fish, or anything that has eyes and ears and some kind of locomotion system. Conventional VR devices, such as Head Mounted Displays (HMD), motion trackers, head phones, now become the eyes and ears of these creatures, provided that their sensory systems are studied sufficiently to allow simulation in VR.

We present a number of alterations to rendering and user motion transfer process that turn a conventional VR system into a virtual zoo. There, each exhibit shows how the world looks and feels through the eyes of a non-human being. For these examples, it is assumed that a stereo HMD is used for visualization and the user head is tracked. There are no specific requirements for VR software platform, other than it must provide full access to rendering and tracking code.

The Animal Reality Exhibits

The examples presented next are of illustrative nature only. The final image of the reality forms in the brain, as the result of multi-stage integration of the visual input with the eye-, head-, and body-motions into one continuous stream. We can not possibly perceive the inner workings of the animal brain. However, we can take a glimpse at the raw input of their visual and spatial senses. For a few minutes, we can cross the line between “us” and “them”, and see the world as a multiverse of animal realities.

Summary

The Animal Reality Exhibits are intended for VR visitors of all ages, for solo and group exploration, education and enjoyment.

Human or baseline configuration consists of conventional stereo HMD setup and direct head tracking. The left and right virtual cameras are co-located with the user’s real eyes, facing forward. The motion of real and virtual head is synchronized via tracking. The image below is a left-right stereo pair, freely fusible.

Giraffe exhibit provides a high vista point due to a long neck and legs and sideways orientation of the eyes, typical for most grazing animals. The perceptual effect of having a long neck is achieved by amplifying user natural head rotations (pitch and roll) before transferring their values onto the virtual cameras.

Chameleons posses a rare ability to rotate their eyes independently from each other. This skills allows them to observe the scene panoramically and prey for insects, perhaps two at a time. To simulate that, each camera must fixate on the closest prey. This feature should be used sparingly.

Bee omnidirectional faceted vision can be simulated by using environmental mapping of the scene image over a flat shaded polygonal mesh. To add motion, a fly-over can be arranged, by orbiting the camera around some object of interest, such as a flower. The orbit can be generated procedurally, or created manually, for a better match with the surrounding geometry. To improve the sense of presence, a fan can be used to produce the wind sensation, with its oscillations synchronized with disturbances in the bee’s path.

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