I'm not there: extending the range of human senses to benefit wildlife corridors

Carol LaFayette, MFA*
Associate Professor
Visualization Department
Texas A&M University

Frederic I. Parke, Ph.D.†
Professor
Visualization Department
Texas A&M University

Ann McNamara, Ph.D.‡
Assistant Professor
Visualization Department
Texas A&M University

Philip Galanter, MFA §
Assistant Professor
Visualization Department
Texas A&M University

Figure 1. Baby birds under daylight (left). Reflectance study, simulated, IR light (middle) and UV light (right).

1. Introduction

We present an immersive environment designed to map animal senses onto those of humans. All around us, animals communicate and perceive with senses quite different from our own. Just as mankind has employed technology to overcome limitations of physical strength, dexterity, and distance, so can we imagine systems that enable us to extend our senses by taking cues from birds, whales and other animals. Our ultimate ambition is to create an interactive real-time, global, subscription-based, enhanced sensory "nature channel." The project would provide freedom to roam remote places with augmented senses and, as a result, benefit wildlife corridors around the world. In the process we explore fundamental questions about our own mental, physiological and technical interpretive process. For example, it's possible to imagine sound translated from beyond the ear's frequency range, but what would it be like to sense electrical fields like a shark?

2. Exposition

Our prototype demonstration is presented on a 5-screen interactive immersive system through which viewers will navigate a remote island environment, home to terrestrial and marine animals. The system will offer several modes developed from scientific studies of selected animals. Our landscape will be navigable with a Wii controller to provide locomotive abilities that extend human range through simulation. One can see in the ultraviolet spectrum, like a bird, or in the infrared range, like a predator. Through audio scaling techniques, one can hear ultrasound clicks like a bat, or infrasound calls like a whale. As a proof of concept, this immersive experience will present a subset of elements of our larger initiative. Imagine a system of stations across the world sending high-definition views and sounds of the last unspoiled environments to your digital television. In cinematic terms, high definition panoramas would form the establishing shots for your personal interactive wildlife movie. Then the system sends close up views through other lenses, modified to access ultraviolet or infrared images, and audio scaled from beyond human range. Wireless capture stations placed in areas traversed by local fauna would transmit motion-activated images in real time, modified for enhanced senses. If this approach became popular on a large scale, it could lead to greater awareness and support for protection of wildlife corridors so essential to the survival of threatened species. This technology would afford citizens the ability to both "be there" and "not be there" — allowing greater habitat and greater freedom of movement for animals.

* e-mail: lurleen@viz.tamu.edu
† e-mail: parke@viz.tamu.edu
‡ e-mail: ann@viz.tamu.edu
§ e-mail: galanter@viz.tamu.edu

Examples of scientific research tied to this project—vision

Many birds have evolved a fourth visual receptor for enhanced perception of detail and color. Certain species show a preference for intensely colored UV markings. [Johnsgard] Many predators on the other hand possess infrared sensory capabilities. Contrasting these different modes of vision the immersive system would switch between normal, enhanced UV and enhanced IR vision. For ultraviolet vision, we would use a color scheme motivated by techniques that cause certain materials to fluoresce. For infrared vision, we would adapt existing "false color" techniques developed for IR sensor data.

Examples of scientific research tied to this project—hearing

Tiger moths can respond to the ultrasound sonar that bats use to locate prey with ultrasound clicks of their own, thus warning bats of their bad taste. [Conner] Whales use infrasound to transmit calls indicating the location of krill concentrations over vast areas of ocean. Thus, whales help each other to conserve energy in seeking out food-rich areas. [Lavoie] Highlighting examples such as these, the immersive system would offer situations that teach by demonstration, providing viewers an opportunity to understand particular instances of vocalization between species. Frequency scaling techniques will be employed to translate audio signals to the range of human perception.

Conclusion

One of the fundamental questions we explore relates to how animal senses might be mapped to human experience. There are four categories of sensing to consider: first, those shifted below or above human range, for example, IR and UV vision, or infrasonic and ultrasonic hearing. Second, senses amplified in intensity when experienced by animals: heightened hearing, vision, touch, and smell. Third, senses mapped in unique ways by animals: sound as a locative sense, or smell to determine directionality. And fourth, senses not in our perceptual repertoire, for example, electric fields sensed by sharks, or chemical cues read by insects. More research is needed to examine how various senses interact, combine, and are hierarchized in animals and humans, as well as how they are processed after stimuli is perceived.

References

JOHNSGARD, P.A., 1999. The Ultraviolet Birds of Nebraska, Biol. Sci. Papers Ornithology, U. Nebraska Lincoln.

CONNOR, W.E., 2008. Tiger Moths and Woolly Bears: Behavior, Ecology, and Evolution of the Arctiidae, p. 186, Oxford Press.

LAVOIE, D, SIMARD, Y, 1999. The rich krill aggregation of the Saguenay-St. Lawrence Marine Park: hydroacoustic and geostatistical biomass estimates, structure, variability and significance for whales. Can. J. Fish. Aquat. Sci 56, 182-197.