

TELE ECHO TUBE

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Abstract

Tele Echo Tube (TET) is a speaking tube installation that allows acoustic interaction with a deep mountain echo through the slightly vibrating lampshade-like interface. TET allows users to interact with the mountain echo in real time through an augmented echo sounding experience with the vibration over satellite data network. This novel interactive system can create an imaginable presence of a mythological creature in undeveloped natural locations beyond our cultural and imaginable boundaries.

Tele Echo Tube (TET), shown in Fig. 1, is a speaking tube that acoustically interacts with a deep mountain echo through the slightly vibrating lampshade-like interface. It is based on the HCBI concept [6], which is an extension of human-computer interaction (HCI). TET allows users to interact with the mountain echo in real time through an augmented echo sounding experience with the vibration over satellite network; users experience a distant mountain forest soundscape in immersive and ambient ways even in the midst of a modern city.

Natural communities contain a spectrum of life forms that interact with each other. Many scientists agree with the judgment that the essence of ecology is the study of interactions among species in their native habitat [1]. Moreover, in

Japanese mythology, it was believed that there are many *Yokai* (妖怪 literally demon, spirit, or monster. ECHO, Mountain Nymph in Greek mythology) living with other animals in the mountain forest environment. In Japanese folklore, *Yokai* is known as "supernatural or unaccountable phenomena to their informants" because *Yokai* generally have a sort of spiritual or supernatural powers. In 1737, Sawaki Suushi, a Japanese artist in Edo Period Japanese, published a picture of a monster called "Mr. Yamabiko" in a collection of pictures "Hyakkai-Zukan" [9] as shown in Fig 2. This is a well-known *Yokai* who creates mountain echo. Based on this Cultural and Imaginable metaphor, TET creates cultural collaboration with "Mr. Yamabiko" and provides an echo sounding experience to users in an imaginable way. TET aims to increase the mythological awareness in a traditional Japanese way of human computer interaction.

Description

TET consists of local and remote speaking tube systems with one-way echo canceller through a full duplex audio I/O system over the globe. The remote and local systems with an identical appearance perform a remote interaction to create an echo sounding and experience with Mr. Yamabiko, located 1,200 m above sea level through a communication satellite at 36,000 km above sea level as a global-scale HCI with cultural emphasis.

The remote system is placed in an uninhabited mountain forest on Chichibu

University Forest, The University of Tokyo in Japan (35°56'17.28"N, 138°48'11.04"E, and 150 km from Tokyo). The songs of small birds, the trickling of a stream, and the sounds of insects moving about in the mountain forest represent of the arrival of spring on the mountain area. However, in those remote areas, such as the home range of the mountain echo, the availability of electric power and information infrastructures for monitoring wild animals is either limited or nonexistent. This is primarily because the profitability generated by infrastructure-based services is usually low in areas such as sanctuary forest where the number of users is small. Thus, it was necessary to develop methods that make TET happen while using the fewest possible resources. The local speaking tube system consists of networked microphones, speakers with a vibrator, and echo canceller. An embedded CPU system receives the live soundscape data from the remote mountain; the satellite network immediately performs echo cancelling on the sound signal and sends it back to the remote side immediately. TET runs on a full-duplex audio pipe over the Internet and uses an echo cancelling process for preventing audio feedback in the loop.

To interact with the Mr. Yamabiko, users can sing out "YO-HOOOOO!" very lively from the local speaking tube to the speakers on the mountain on the remote site, as described. The loopback call at the remote host occurs because the playback sound from the speaker is captured and transferred to the user by the remote host with spontaneous network delay. When the users hear the loopback call, "their voices within the soundscape" from the mountain with the slight vibration by their hands through the interface, they recognize that the initial voices did actually travel through the mountain environment. This echo-sounding loop, which transfers live sounds bidirectionally from the remote and local sites, creates an echo sounding effect, and in doing so gives the user the opportunity to interact with the presence of "a fickle ECHO" on the deep mountain remotely. This echo-like experience of believable interaction in augmented reality gave users an imaginable presence of Mr. Yamabiko with high degree of excitement in the country[5] and overseas[4]. Those acoustic interactions indicate the non-linguistic believability in a form of mythological metaphor of the mountain echo. Thus, the TET of the HCBI interface successfully achieves a

Fig. 1. The Tele Echo Tube (mountain version) was selected to be included in the BASAL Exhibition, 2010, at the Museo Universitario de Arte Contemporáneo, Mexico. © Hill H. Kobayashi. Photo © Andrea Ferreiro.)



feeling of belonging to nature even in the midst of a city, through a believable interaction with the mountain ECHO beyond our cultural and imaginable boundaries

Discussions

Before human beings became capable of leveling mountains with heavy construction vehicles, Japanese farmers prayed to gods in seasonal festivals for the weather conditions needed to ensure successful crop production and the general population was taught to respect the gods that resided in and protected the mountains. Recent technological and information advancements, including satellite imaging, have been unable to confirm the presence of mythological creatures in undeveloped and uninhabited natural locations, and very few humans now believe in the existence of gods that control weather or other farming conditions. However, because we no longer embrace the presence of such cultural and imaginable metaphors in our daily lives, especially in city life, there has been little outcry at the severe devastation of nature brought about by the urbanization process.

The author initially introduced the concept of HCBI at HCI venues discussing environmental sustainability in 2009 [6]. The theory, method, and evaluation of human and wildlife interaction were not discussed in detail because the research was not sufficiently well developed. However, the future direction of HCBI has been suggested by several researchers. In 2010, DiSalvo et al. stated [2] that HCBI points out the inherent contradiction in attempting to use technology to create more intimate connections with nature and Pereira et al. cited HCBI as an example of sustainable computing [8]. Giannachi [3] stated that HCBI clothing, for example the Wearable Forest system [7], facilitates the creation of a human-computer environment that enables new forms of communication.

The type of nonhuman-centric interaction described is reflected in the semiotic theories of Jakob von Uexküll [10]. Von Uexküll established the theory of Umwelt, from the German word meaning “environment” or “surrounding world.” This theory suggests that all animals, from the simplest to the most complex, fit into their unique worlds with equal completeness. A simple world



Fig. 2. Sawaki Suushi, picture of a monster called “Mr. Yamabiko” in a collection of pictures “Hyakkai-Zukan”[9].

corresponds to a simple animal, and a well-articulated world corresponds to a complex one. In the HCBI framework, the sounds of a forest or other natural environments are all information cues that help us to observe reality and build knowledge of reality. Thus, through HCBI, we can experience the marvel of all living beings and their relationships, including their interactions with elements of their reality [6]. With HCBI, we can begin to interact with commonly inaccessible ecological systems beyond our cultural and imaginable boundaries.

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