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A Device For Blind Human Ultrasonic Echolocation

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***Abstract*- This paper present a device that combined the principles of ultrasonic human echolocation and animal echolocation .This device is helpful for blind and visually impaired people. Some animals such as (bats and dolphin) sense by active echolocation, in which emitted acoustic pulses and their reflection are used to sample the environment .Bats and dolphin are highly informative compared to humans. Active echolocation is also used by some blind humans, who use signals such as tongue clicks cane taps as mobility aids. The device consists of a headset with an ultrasonic emitter and stereo microphones affixed with artificial pinnae. Methods-: The echoes of ultrasonic pulses are recorded and time-stretched to lower their frequencies into the human auditory range before being played back to the user. Results- Simple words were able to lateral depth and distance judgments. This device is working as record the echoes. Conclusion-: This device is suggests can be used effectively for environment and human auditory system. Many humans is suffer for blindness (cardiac patient) and night visions this devices uses in this people.**

***Key Words*-: echolocation, animal, human, blind, ultrasonic, device.**

I. INTRODUCTION

This device is work according to animal echolocation technique is make of ultrasonic device is useful for blind humans and visually impaired. This device is combined that the principle of animal echolocation and human echolocation.

II. ANIMAL ECHOLOCATION

Echolocation, also called bio sonar, is the biological sonar used by several kinds of animals. Echo locating animals emit calls out to the environment and listen to the echoes of those calls that return from various objects near them [1]. They use these echoes to locate and identify the objects. Some animals like as micro chiropteran bats and odontocetes (toothed whales and dolphins). Microbats generate ultrasound via the larynx and emit the sound through the open mouth or, much more rarely, the nose. The latter is most pronounced in the horseshoe bats (*Rhinolopus.*). Microbats calls range in frequency from 14,000 to well over 100,000 Hz, mostly beyond the range of the human ear (typical human hearing range is considered to be from 20 Hz to 20,000 Hz)[2]. Bats may estimate the elevation of targets by interpreting the interference patterns caused by the echoes reflecting from the tragus, a flap of skin in the external ear. The relative intensity of sound received at each ear as well as the time delay between arrival at the two ears provide information about the horizontal angle (azimuth) from which the reflected sound waves arrive.

III. HUMAN ECHOLOCATION

Human echolocation is the ability of humans to detect objects in their environment by sensing echoes from those objects, by actively creating sounds – for example, by tapping their canes, lightly stomping their foot, snapping their fingers, or making clicking noises with their mouths – people trained to orient by echolocation can interpret the sound waves reflected by nearby objects, accurately identifying their location and size [3]. This ability is used by some blind people for acoustic way finding, or navigating within their environment using auditory rather than visual cues [4]. It is similar in principle to active sonar and to animal echolocation [7][8], which is employed by bats, dolphins and toothed whales to find prey. Some blind people are skilled at Echolocating silent objects simply by producing mouth clicks and listening to the returning echoes. It has been shown that blind echolocation experts use what is normally the "visual" part of their brain to process the echoes.

IV. SONIC EYE-:

Here we present a device, referred to as the Sonic Eye that uses a forehead-mounted speaker to emit ultrasonic “chirps” (FM sweeps) modeled after bat echolocation calls[9][10].The echoes are recorded by bilaterally mounted ultrasonic microphones, each mounted inside an artificial pinna, and also modeled after bat pinnae to produce direction-dependent spectral cues[12][13]. After each chirp, the recorded chirp and reflections are played back to the user at 1m of normal speed, where m is an adjustable magnification factor [15][16]. This magnifies all temporally based cues linearly by a factor of m and lowers frequencies into the human audible range. For empirical results reported here, m is 20 or 25 as indicated [19][20]. That is, cues that are normally too high or too fast for the listener to use are brought into the usable range simply by replaying them more slowly [23][24][25].

Although a number of electronic travel aids that utilize sonar have been developed (e.g., [26], [27], [28], [29]), none appear to be in common use, and very few provide information other than range-finding or a processed localization cue. For example in [27], distance to a single object is calculated and then mapped to a sound frequency, providing only extremely limited information about the world. The device presented in [26] is the most similar to the Sonic Eye. In [26] ultrasonic downward frequency sweeps are emitted, and then time stretched before presentation to the user. However the signals are time stretched in 2 micro sec chunks sampled every 100 microsecond, the overall playback of the echoes is not time stretched, no pinnae are used, the binaural microphones are placed only 2 cm apart, and microphone and transducer fidelity is unknown. In contrast, the Sonic Eye provides a minimally processed input which, while initially challenging to use, has the capacity to be much more informative and integrate better with the innate human spatial hearing system. The relatively raw echoes contain not just distance information but horizontal location information and also vertical location information.

V. PROCESSING STEPS

Step 1: The computer generates a chirp waveform, consisting of a 3 ms sweep from 25 kHz to 50 kHz with a constant sweep rate in log frequency.

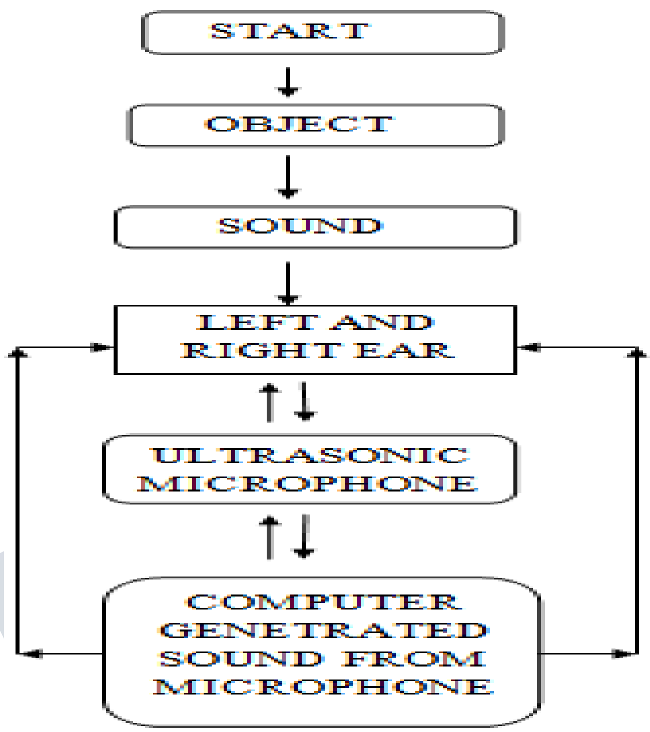
Step-2 The initial and final 0.3 ms are tapered using a cosine ramp function. The computer, in a small enclosure mini-ITX case, runs Windows 7 and performs all signal processing using a custom Matlab program.

Step-3 The recorded signal is band pass-filtered using Butterworth filters from 50 to 25 kHz, and time-dilated by a factor of m. For m = 25, the recorded ultrasonic chirp and echoes now lie between 1 and 2 kHz.

Step-4 The processed signal is played to the user through Air Drives open-ear headphones, driven by a Gigaport HD USB soundcard.

Step-5 They is measure the time distance and depth.

FLOW CHART



VI. METHODS

We measured angular transfer functions for the ultrasonic speaker and microphone in an anechoic chamber (Figure 3). The full-width half-max (FWHM) angle for speaker power was ~50~, and for the microphone ~160~. Power was measured using bandpass Gaussian noise between 25 kHz and 50 kHz.

VII.EXPERIMENT,

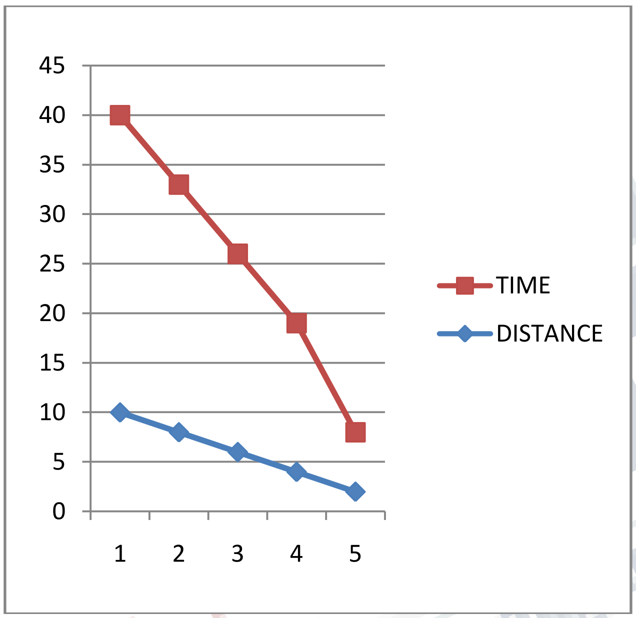
EXPERIMENT-1

S.NO	DISTANCE	TIME
1.	10 KM	30 MINUTES
2.	8KM	25 MINUTES
3.	6KM	20 MINUTES
4.	4KM	15 MINUTES
5.	2KM	10 MINUTES

THE EXPERIMENT IS TESTED THE FREQUENCY 25 HZ TO 50 HZ

WITH DEVICE

TESTED WITH DEVICE

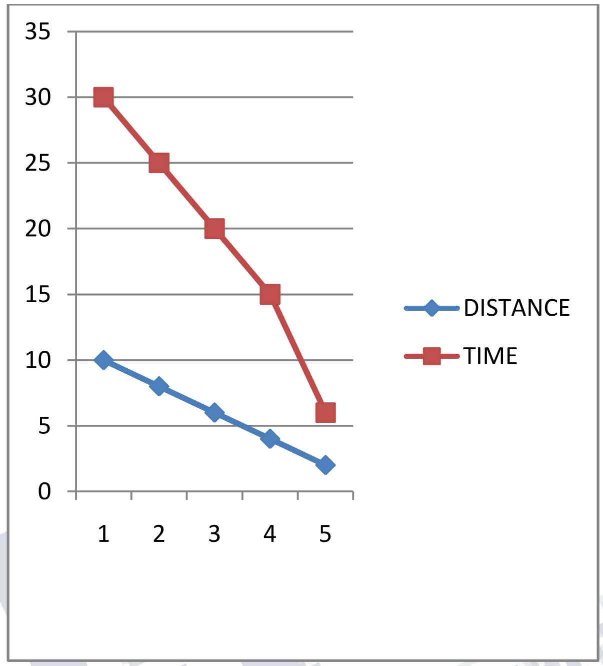


EXPERIMENT-2

THE EXPERIMENT IS TESTED THE FREQUENCY 25 HZ TO 50 HZ WITHOUT

S.NO	DISTANCE	TIME
1.	10KM	5MINUTE
2	8KM	5 MINUTE
3	6KM	3 MINUTE
4	4KM	2 MINUTE
5	2KM	2 MINUTE

TESTED WITHOUT DEVICE



VIII. SUMMARY AND CONCLUSION-

Here we present a prototype assistive device to pulse echo time delays, made available through the time in navigation and object perception via ultrasonic echo location .The ultrasonic signals exploit the advantages of high frequency sonar signals and time-stretch them into human audible frequencies. Depth information is encoded in stretching process. Azimuthal location information is encoded as interaural time and intensity differences between echoes recorded by the stereo microphones. Finally, elevation information is captured to the microphones as direction-dependent spectral filters. Thus, the device presents a three-dimensional auditory scene to the user with high theoretical spatial resolution, in a form consistent with natural spatial hearing. Behavioural results from two experiments with naive sighted volunteers demonstrated that two of three spatial dimensions (depth and laterality) were readily available with no more than one session of feedback/training. Elevation information proved more difficult to judge, but a third experiment with moderately trained users indicated successful use of elevation information as well. Taken together, we interpret these results to suggest that while some echoic cues provided by the device are immediately and intuitively available to users, perceptual acuity is potentially highly amenable to training. Thus, the Sonic Eye may prove to be a useful assistive device for persons who are blind or visually impaired.

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