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Investigation of Enhancement of OM Chanting Sound by Shankha

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***Abstract*—**In this research work sound processing capability of shankha is investigated. OM chanting sound is filtered using shankha. Six shankha with different shape and size are taken. Various parameters such as first formant frequency, minimum and maximum pitch and intensity of the recorded signal are compared with original signal. The signal processed through shankha showed higher pitch as well as intensity as compared to the original signal.

***Keywords*—** Sound, shankha, shape, size, pitch, intensity.

I. Introduction

Sound is the expeditiously varying pressure wave travelling through a medium. When sound peregrinates through air, the atmospheric pressure varies periodically. The number of pressure variations per second is called the frequency of sound, and is quantified in Hertz (Hz) which is defined as cycles per second. The higher the frequency, the more high-pitched a sound is perceived. The sounds engendered by drums have much lower frequencies than those engendered by a whistle, as shown in the following diagrams. Please click on the demo button to auricularly discern their sounds and the difference in pitch. Another property of sound or noise is its loudness. A loud noise customarily has a more astronomically immense pressure variation and an impotent one has more diminutive pressure variation. Pressure and pressure variations are expressed in Pascal, abbreviated as Pa, which is defined as N/m2 (Newton per square metre) [1-2].

Human auditory perceiver can perceive a very wide range of sound pressure. The softest sound a mundane human auditory perceiver can detect has a pressure variation of 20 micro Pascals, abbreviated as µPa, which is 20 x 10-6 Pa ("20 millionth of a Pascal") and is called the Threshold of Aurally perceiving. On the other hand, the sound pressure proximate to some very strepitous events such as launching of the space shuttle can engender a sizably voluminous pressure variation at a short distance of approximately 2000 Pa or 2 x 109 µPa [3-4].

To express sound or noise in terms of Pa is quite inconvenient because we have to deal with numbers from as diminutive as 20 to as astronomically immense as 2,000,000,000. The following table shows some prevalent sound or noise in terms of µPa. A simpler way is to utilize a logarithmic scale for the loudness of sound or noise, utilizing 10 as the base. The following is a brief prelude of the mundane logarithm to the base 10. To avoid expressing sound or noise in terms of Pa, which could involve some unmanageable numbers, the decibel or dB scale is utilized. The scale utilizes the auditory perception threshold of 20 µPa or 20 x 10^{-6} Pa as the reference level. This is defined as 0 dB. Sound pressure level, which is often abbreviated as SPL or L_p, in decibels (dB), can then be obtained utilizing the following formula [5].

$$SPL(dB) = 20\log_{10}\frac{S_m}{S_r}$$

Source of Sound/Noise	Sound Pressure (µPa)
Launching of the Space Shuttle	2,000,000,000
Full Symphony Orchestra	2,000,000
Diesel Freight Train at High Speed at 25 m	200,000
Normal Conversation	20,000
Soft Whispering at 2 m in Library	20,000
Unoccupied Broadcast Studio	200
Softest Sound Human can Hear	20

Vocal tract modifies the temporal and spectral distribution of power in the sound waves. The main organs related to speech production are shown in Fig. 1. In the vocal tract, the tongue, lower teeth and lips undergo significant movements during speech production. In vocal tract, larynx is the structure that holds and manipulates the vocal cords; and pharynx is the cavity between the roof of the tongue and the walls of the upper throat. The hard portion of the roof of mouth is hard palate or palate only. The soft portion of the roof of the mouth, lying behind the hard palate is velum or soft palate. After leaving the larynx, air from the lungs passes through the pharyngeal and oral cavities, and then exits at the lips [6]. For nasal sounds, air is allowed to enter the nasal cavity by lowering the velum. During normal breathing also, the velum lowers to allow air through the nostrils. The velum is kept in a raised position for most speech sounds, blocking the nasal cavity from receiving air. The passage between lungs and vocal tract is called trachea, which divides into two bronchial tubes towards the lungs. A non-speech organ called as epiglottis protects the larynx from food and drink. The vocal folds inside the larynx are typically about 15 mm long, have a mass of about 1 gram each and have amplitude vibrations of about 1 mm. The variable opening between the vocal cords (about 8 mm wide at rest) is known as glottis. During a glottal

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stop, the vocal cords are held together and there is no opening between them [7-8].

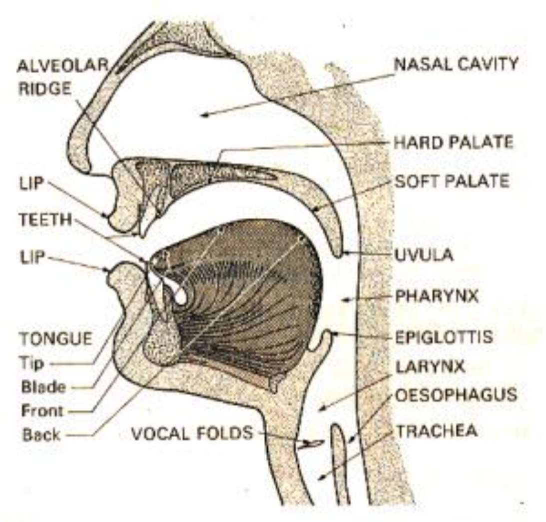

Fig. 1. Human vocal tract.

Speech is generated as one exhales air from the lungs while the articulators move. The lungs provide the airflow and pressure source for speech, and the vocal cords usually modulate the airflow to create many sound variations. This sound production can be assumed as a filtering process in which a speech sound source excites the vocal tract filter. The source is either periodic causing voiced speech, or is noisy (aperiodic) causing unvoiced speech. The reason of the periodicity for the former is found in the larynx, where vibrating vocal cords interrupt the airflow from the lungs, producing pulses of air. Understanding the human voice production mechanism is not only extremely difficult but also highly challenging due to the fact that humans are capable of varying extensively the functioning of their vocal organs. In a simple way, speech sounds can be categorized into three main classes according to the production mechanism. The three classes are voiced sounds, which are excited by the fluctuation of the vocal folds; unvoiced sounds, where the sound excitation is turbulent noise; and plosives, which are transient-type sounds made up by abruptly releasing the air flow that has been blocked by, for example, the lips. Among these three categories, voiced sounds, and especially their subgroup, vowels, represent a study goal that has been of special interest in the history of speech science [6].

Conch Shells which spiral to the right are very rare and considered especially sacred, the right spiral mirroring the motion of the sun, moon, planets and stars across the sky. Also, for Buddhists, the hair whorls on Buddha's head spiral to the right, as do his fine bodily hairs, the long white curl between his eyebrows and the conch like swirl of his navel. The Lakshmi Conch shell is a sacred manifestation of Supreme Goddess Lakshmi, and is most effectively used to bath a genuine Gandaki Vajra-kita Shalagram Shila (ammonite from Gandaki River in Nepal having chakra cut by Vajra-kita worms 140 million years ago).

This shell is from a sea snail species Turbinella pyrum in the family Turbinellidae. This species is found living in the Indian Ocean and surrounding seas. The shell is porcelaneous (i.e. the surface of the shell is strong, hard, shiny, and somewhat translucent, like porcelain).

The overall shape of the main body of the shell is oblong or conical. In the oblong form, it has a protuberance in the middle, but tapers at each end. The upper portion (the siphonal canal) is corkscrew-shaped, while the lower end (the spire) is twisted and tapering. Its colour is dull, and the surface is hard, brittle and translucent. Like all snail shells, the interior is hollow. The inner surfaces of the shell are very shiny, but the outer surface exhibits high tuberculation. In Hinduism, the shiny, white, soft shankha with pointed ends and heavy is the most sought after [51].

Based on its direction of coiling, the shankha has two varieties. A Dakshinavarti Shankh: This is the very rare sinistral form of the species, where the shell coils or whorls expand in a counterclockwise spiral if viewed from the apex of the shell. The Vamavarta ("left-turned" as viewed with the aperture uppermost): This is the very commonly occurring dextral form of the species, where the shell coils or whorls expand in a clockwise spiral when viewed from the apex of the shell. In Hinduism, a dakshinavarta shankha symbolizes infinite space and is associated with Vishnu. The Vamavarta shankha represents the reversal of the laws of nature and is linked with Shiva. The Dakshinavarta shankha is believed to be the abode of the wealth goddess Lakshmi - the consort of Vishnu, and hence this type of shankha is considered ideal for medicinal use. It is a very rare variety from the Indian Ocean. This type of shankha has three to seven ridges visible on the edge of the aperture and on the columella and has a special internal structure. The right spiral of this type reflects the motion of the planets. It is also compared with the hair whorls on the Buddha's head that spiral to the right. The long white curl between Buddha's eyebrows and the conch-like swirl of his navel are also akin to this shankha. The Varaha Purana tells that bathing with the Dakshinavarta shankha frees one from sin. Skanda Purana narrates that bathing Vishnu with this shankha grants freedom from sins of seven previous lives. A Dakshinavarta shankha is considered to be a rare "jewel" or ratna and is adorned with great virtues. It is also believed to grant longevity, fame and wealth proportional to its shine, whiteness and largeness. Even if such a shankha has a defect, mounting it in gold is believed to restore the virtues of the shankha [9-10].

II. Methodology

In this research paper enhancement in the OM chanting sound by different shankha are investigated. Six shankha with variable dimensions and weight were taken for the experiment. The shankha used in the experiment is shown in fig. 2. The structural and geometrical properties of the shankha are given in table I. It can be observed that shankha of varied dimensions are taken for the experimental process. The OM chanting signal is passed through the shankha and output from

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the shankha is recorded using high quality recording system. The recorded signal is further analyze using Praat software.

Fig. 2.

Table I. Dimensional parameters of the shankha.

Shankha No.	Weight (gm)	Length (cm)	Internal Diameter (cm)
S1	358	16	25
S2	240	14	21
S3	556	21	31
S4	164	12	20
S5	200	10	18
S6	502	17	29

III. Results and Discussion

Investigations were carried out using OM sound which is passed through the shankha and various parameters such as first formant frequency, pitch, and intensity of sound is compared with original sound. Figure 5.4 and 5.5 shows the intensity and pitch plot of original sound.

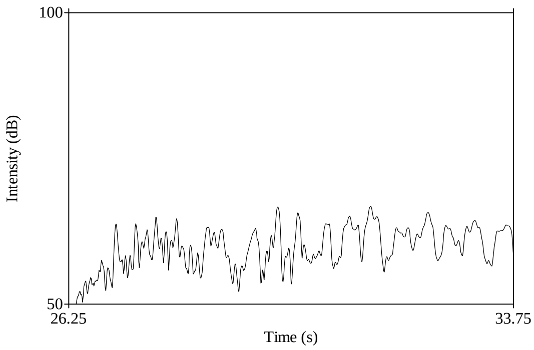

Fig. 3 Intensity of original traffic signal.

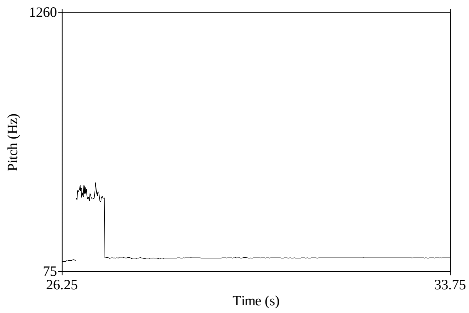

Fig. 4. 4 Pitch of original traffic signal.

Various parameters such as first formant frequency, minimum and maximum pitch, minimum and maximum intensity of all the recorded signals from six shankha are computed and tabulated in Table II and Table III. All the shankha shows different behavior towards the sound signal. Maximum pitch is observed in case S2 shankha and minimum pitch is observed in case of S1 shankha. Figure 5-10 shows the normalized sound signal and spectrogram of recorded OM sound from six different shankha. Figure 11 shows first formant frequency of recorded signal. It is observed that maximum frequency comes out to be 1400 Hz for S5 shankha.

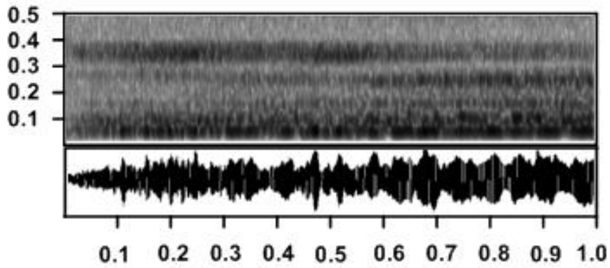

Fig. 5. Normalized signal and spectrogram of recorded traffic noise signal from shankha S1.

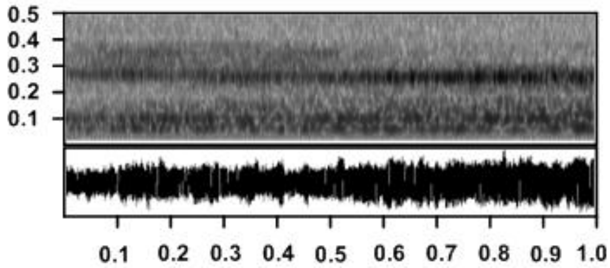

Fig. 6. Normalized signal and spectrogram of recorded traffic noise signal from shankha S2.

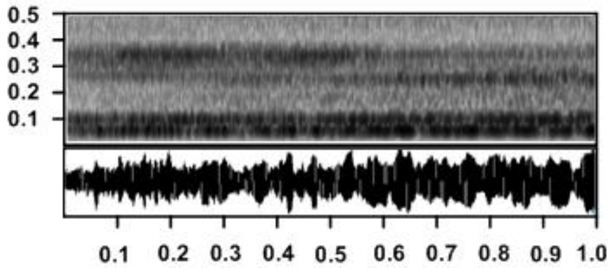

Fig. 7. Normalized signal and spectrogram of recorded traffic noise signal from shankha S3.

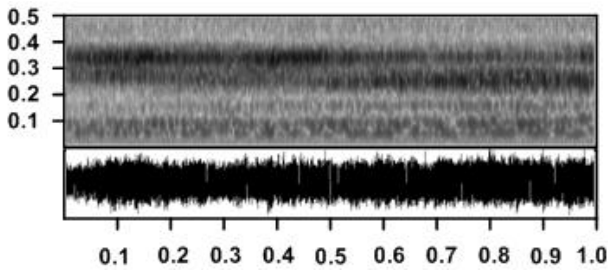

Fig. 8. Normalized signal and spectrogram of recorded traffic noise signal from shankha S4.

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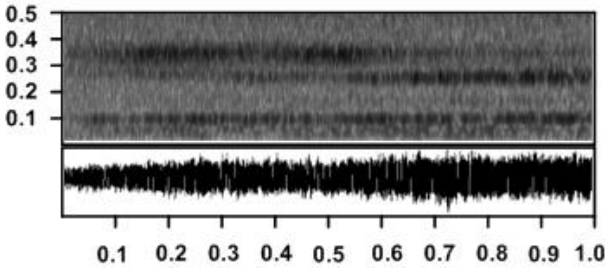

Fig. 9. Normalized signal and spectrogram of recorded traffic noise signal from shankha S5.

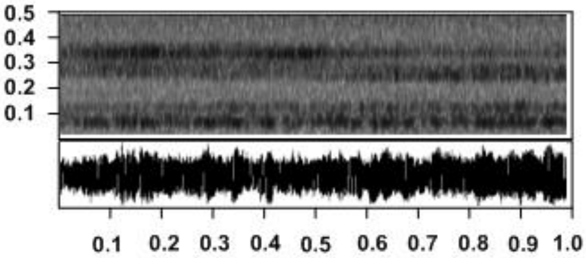

Fig. 10. Normalized signal and spectrogram of recorded traffic noise signal from shankha S6.

TABLE II. Pitch of recorded signal.

S. No	Minimum Pitch (Hz)	Maximum Pitch (Hz)
Original	136.26	273.89
S1	118.50	368.51
S2	91.99	369.86
S3	114.43	368.60
S4	169.66	398.53
S5	112.43	369.92
S6	112.77	367.13

TABLE III. Intensity of recorded signal.

S. No	Minimum Intensity (dB)	Maximum Intensity (dB)
Original	63.08	77.64
S1	66.98	84.76
S2	62.48	82.64
S3	62.61	83.29
S4	63.70	83.45
S5	48.91	71.38
S6	51.98	77.99

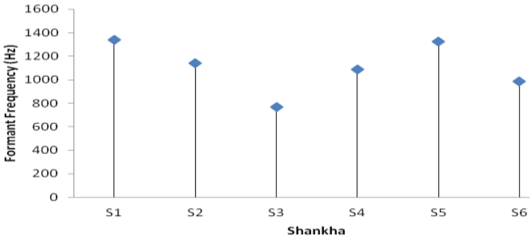

Fig. 11. First formanant frequency of recorded signal.

IV. Conclusion

In this research paper effect of shankha size and shape were investigated for enhancement of OM chanting sound. It is observed from the results that shankha are having high intensity as compared to original signal. S1 shankha shows highest pitch value compared to other shankha. Dimension and weight of shankha plays important role in sound processing capability.

References

[1] S. V. Vaseghi, *Advanced Signal Processing and Digital Noise Reduction*, Wiley Teubner, 1996.

[2] J. John R. Deller, J. H. L. Hansen, and J. G. Proakis, *Discrete-Time Processing of Speech Signals*, New York: IEEE Press, 2000.

[3] D. E. Tsoukalas, J. N. Mourjopoulos, and G. Kokkinakis, “Speech enhancement based on audible noise suppression,” *IEEE Trans. Speech and Audio Processing*, vol. 5, pp. 497-514, Nov. 1997.

[4] N. Virag, “Single channel speech enhancement based on masking properties of the human auditory system,” *IEEE Trans. Speech and Audio Processing*, vol. 7, pp. 126-137, Mar. 1999.

[5] D. O. Shaughnessy, *Speech Communications: Human and Machine*, IEEE Press, 2nd ed., 2000.

[6] B. Gold and N. Morgan, *Speech and Audio Signal Processing: Processing and Perception of Speech and Music*, John Wiley & Sons, 1999.

[7] E. Terhardt, G. Stoll, and M. Seewann, “Algorithm for extraction of pitch and pitch salience from complex tonal signals,” *J. Acoust. Soc. Am.*, vol. 71, Mar. 1982.

[8] S. Voran, “Observations on auditory exitation and masking patterns,” in *Applications of Signal Processing to Audio and Acoustics, IEEE ASSP Workshop on*, pp. 206-209, Oct. 1995.

[9] Naidu, S. Shankar Raju; Kampar, Tulasīdāsa, “A comparative study of Kamba Ramayanam and Tulasi Ramayan. Shank,” University of Madras, pp. 44, 2009.

[10] The Wealth of Indian Alchemy & Its Medicinal Uses: Being an English Translation of Rasajalanidhi, Indian Medical Science Series, Sri Satguru Publications, vol. 1, 1998.

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