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Investigation of Filtering Effect of Shape and Size of Shankha on Traffic Noise

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***Abstract*—**Research work is carried to investigate the sound processing capability of shankha. Various experiments were carried out with different shape and size of shakha. Traffic noise signal is passed through six shankha with varying dimensions and weight. High quality recording system is employed to record the output signal from shankha. Various parameters such as first formant frequency, pitch and intensity of the recorded signal is analyzed and compared with original signal.

***Keywords*—** Sound; traffic; noise; shankha; shape.

I. Introduction

Sound is a form of energy that is transmitted by pressure variations which the human auditory perceiver can detect. When one plays a musical instrument, verbalize a guitar, the vibrating chords set air particles into vibration and engender pressure waves in the air. A person nearby may be then aurally perceive the sound of the guitar when the pressure waves are perceived by the auditory perceiver. Sound can withal peregrinate through other media, such as dihydrogen monoxide or steel. Apart from musical instruments, sound can be engendered by many other sources - man's vocal cord, a running engine, a vibrating loudspeaker diaphragm, an operating machine implement, and so on [1-3].

Noise can be defined as “discrepant or undesired sound” or other perturbance. From the acoustics perspective, sound and noise constitute the same phenomenon of atmospheric pressure fluctuations about the mean atmospheric pressure; the differentiation is greatly subjective. What is sound to one person can very well be noise to somebody else. The apperception of noise as a solemn health hazard is a development of modern times. With modern industry the multitude of sources has expedited noise-induced aurally perceiving loss; amplified music withal takes its toll. While amplified music may be considered as sound (not noise) and to give pleasure to many, the extortionate noise of much of modern industry probably gives pleasure to very few or none at all [4]. When a sound is picked up by a microphone, noise | in the sense of sounds other than the one of interest-will be picked up as well. It should be noted however, that in the context of acoustic signals, the definition of noise is a subjective matter. For example, the sound made by the audience in a concert hall is usually considered to be part of the performance. It carries information about the audience reaction to the performance. Usually, acoustic noise that was picked up by a microphone is undesirable, especially if it reduces the perceived quality or intelligibility of the recording or transmission. Noise may be classified as steady, non-steady or impulsive, depending upon the temporal variations in sound pressure level.

- Steady noise is a noise with negligibly small fluctuations of sound pressure level within the period of observation. If a slightly more precise single-number description is needed, assessment by NR (Noise Rating) curves may be used.
- A noise is called non-steady when its sound pressure levels shift significantly during the period of observation. This type of noise can be divided into intermittent noise and fluctuating noise.
- Fluctuating noise is a noise for which the level changes continuously and to a great extent during the period of observation.
- Tonal noise may be either continuous or fluctuating and is characterized by one or two single frequencies. This type of noise is much more annoying than broadband noise characterized by energy at many different frequencies and of the same sound pressure level as the tonal noise. Noise characteristics classified according to the way they vary with time. Constant noise remains within 5 dB for a long time. Constant noise which starts and stops is called intermittent.
- Intermittent noise is noise for which the level drops to the level of the background noise several times during the period of observation. The time during which the level remains at a constant value different from that of the ambient background noise must be one second or more. This type of noise can be described by the ambient noise level, the level of the intermittent noise, and the average duration of the on and off period. In general, however, both levels are varying more or less with time and the intermittence rate is changing, so that this type of noise is usually assimilated to a fluctuating noise as described below, and the same indices are used [8].

In this research paper processing of traffic.

II. Shankha

The Indian Conch is a handsome gastropod mollusc found in Indian waters in large numbers in comparatively shallow water shown in Fig. 1. Its geographical distribution is peculiar; on the west coast of India large numbers are fished off the Kathia- war coast, but southward of this, we find no trace of the chank till we reach the southern coastline of Travancore

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where this shell again appears and forms the object of a small fishery. On the East Coast of India its distribution is more extensive, being found and fished everywhere from Cape Comorin to Madras City. The northern limit on this coast may be placed at the mouths of the Godaveri, where I have found a few shells, all marked by stunted growth — individuals living in an unfavourable environment. The northern shores of Ceylon, from Puttalam in the north-west to Trincomalee on the north-east, yield large numbers of this shell; it is also to be found at the Andaman Islands.

Fig. 1. Image of Indian shankha.

The bottom most favored of Turbinella pyrum is a sandy one containing a moderate proportion of mud; this character of bottom is admirably suited to the luxuriant growth of tube-building polychset worms which constitute the main food supply of the chank. These polycheets are of several genera, the most abundant being Terebellids. In some places in the Gulf of Mannar, square miles of sea-bottom are monopolised by these Terebellids and the chanks and echinoderms which prey upon them; a veritable Tere-bella — Turbinella — Echinoderm formation. The edges of rocky reefs and the sandy patches interspersed among the rocks are other favourite haunts of chanks as the worms on which they prey are usually abundant there [46-48]. The adult chank is characteristically thick-walled and massive; in the live condition the exterior is covered with a dense brown and velvety horny layer, the periostracum; after death this dries, becomes brittle and eventually peels off, so that shells exposed for any length of time on the sea-shore or buried for any considerable period, become naked and reveal the characteristic snowy-white porcellaneous nature of the shell clearly. In fully grown shells the rows of chestnut brown spots which are normally very distinct on the outer surface in the immature, tend to disappear and often heroine entirely obliterated. Around the mouth, especially along the inner edge of the lip, a faint pink tint is often seen in fully mature shells, while occasionally the whole interior surface of the mouth may assume a brick-red colouration particularly in shells from certain localities.

III. METHODOLGY

In this experiment traffic noise is passed through all the shankha and the output sound is recorded using a high quality sound recorder and saved in system for further processing. The recording process is carried out in acoustic proof surrounding such that no other sound can interfere. For experiment purpose six shankha were used shown in fig. 2. The dimensional parameters are given in table I.

Fig. 2. Shankha used in the experiment.

TABLE I. Structural parameters of 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

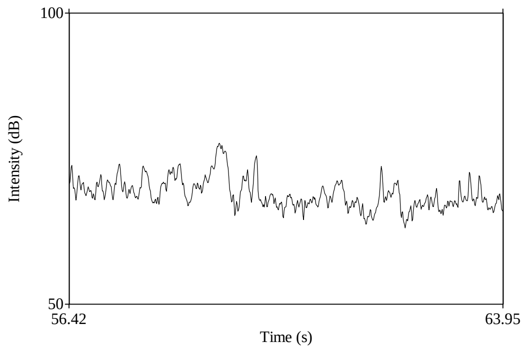

Fig. 3. Intensity of original traffic signal.

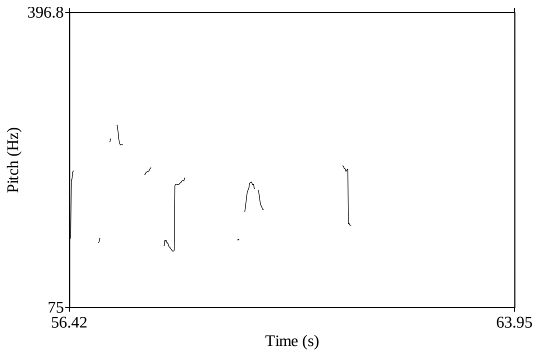

Fig. 4. Pitch of original traffic signal.

IV. RESULT AND DISCUSSION

In this part of the research work traffic noise is passed through six different shankha and the output is recorded using high quality sound recording system. The intensity and pitch of original signal is shown in fig. 3 and fig. 4. The minimum and maximum intensity comes out to be 63.08 dB and 77.64 dB respectively. The minimum and maximum pitch of the signal is 136.26 Hz and 273.89 Hz. The first formant frequency comes out to be 862.68 Hz. Normalized signal and spectrogram of original traffic noise and recorded traffic is

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shown in fig. 5.

Various parameters such as first formant frequency, minimum and maximum pitch, minimum and maximum intensity of original and recorded signal are given in Table II and table III. It is observed that after the signal is passed through different shankha and elevation in pitch parameter is observed and also same phenomenon is seen for intensity parameter. It is observed from the computed values, that minimum pitch value is lower than original signal minimum pitch value but the maximum pitch value for recorded signal is higher than the original maximum pitch value. Also the first formant frequency is higher than the original except for Shankha S3. Intensity of the sound shows different behavior. Fluctuation in the value of intensity is seen. First four shankha shows higher intensity as compared to the original signal intensity whereas S1 shows higher minimum intensity as compared to minimum intensity of the original signal. Figure 5-11 shows the normalized signal and spectrogram of original and recorded signal from all the shankha.

TABLE III. Various parameters of original and recorded signal.

Shankha No.	Formant Frequency Hz (F1)	Minimum Pitch (Hz)	Maximum Pitch (Hz)
Original	862.68	136.26	273.89
S1	1340.85	118.50	368.51
S2	1138.75	91.99	369.86
S3	766.78	114.43	368.60
S4	1089.17	169.66	398.53
S5	1326.67	112.43	369.92
S6	983.42	112.77	367.13

TABLE IIII. Intensity of original and recorded signal.

Shankha 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

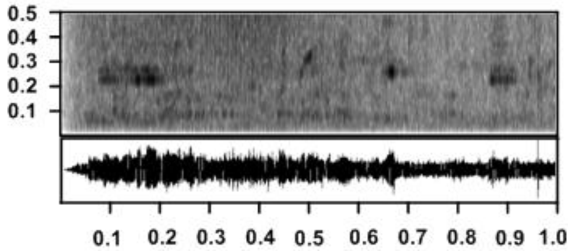

Fig. 5. Normalized signal and spectrogram of original traffic noise signal.

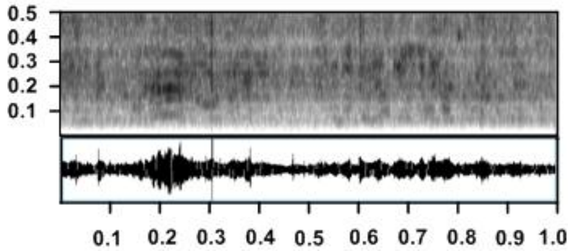

Fig. 6. Normalized signal and spectrogram of recorded traffic noise signal from shankha S1.

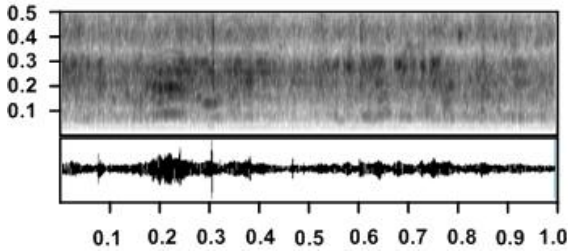

Fig. 7. Normalized signal and spectrogram of recorded traffic noise signal from shankha S2.

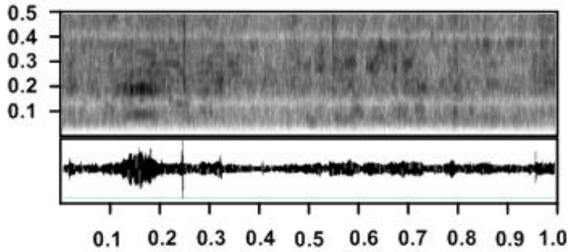

Fig. 8. Normalized signal and spectrogram of recorded traffic noise signal from shankha S3.

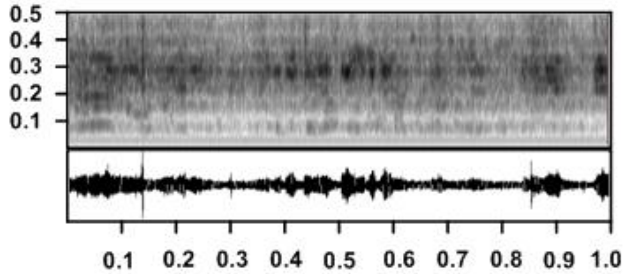

Fig. 9. Normalized signal and spectrogram of recorded traffic noise signal from shankha S4.

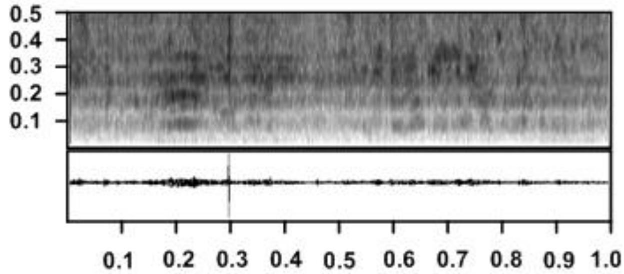

Fig. 10. Normalized signal and spectrogram of recorded traffic noise signal from shankha S5.

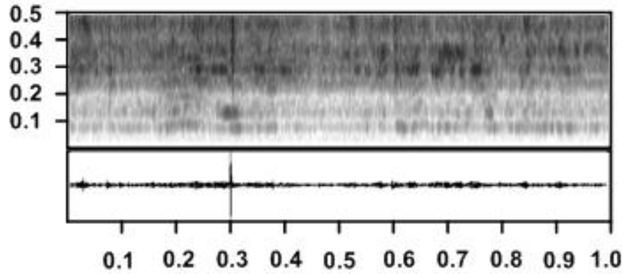

Fig. 11. Normalized signal and spectrogram of recorded traffic noise signal from shankha S6.

V. Conclusion

In this research paper shankha were assessed to investigate their sound processing capabilities. It is observed from the results that shankha with high weight shows low first formant frequency. S4 shankha shows highest pitch value compared to other shankha. S1 shows the maximum sound intensity. Dimension and weight of shankha plays important role in sound processing capability.

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