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Spectral Analysis of Sanskrit Devine Sound OM

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Abstract: Our attentiveness and concentration are pilfered from us by the proceedings take place around us in the world in recent times. Different challenges and impediments are faced by the people work in the industries, offices and even in business. It is tough to handle the stress some times. Therefore, to come out of the aforementioned troubles, meditation is essential for all human beings. In the same way, for pschychological stress, speech signal is uttered to be a considerable indicator. In the direction of mediating human subject, OM is a spiritual mantra, outstanding to fetch peace and calm. The entire psychological pressure and worldly thoughts are taken away by the chanting of OM mantra. Elimination of disruption and introduction of new dynamism in the body are given by the OM chanting. The consciousness could be promoted through the repetition of OM mantra. Furthermore, this mantra transcends the restrictions of a mentality. To systematically understand the meditative chant, termed the divine sound OM, is the endeavor of this research work. Spectral analysis has been carried out for OM mantra to study its structure and to identify the factors, which have been found to influence the human nerve system. By this analysis, we could conclude stress gets minimized after OM chant.

Key words: OM mantra, meditation, white noise, power spectral density

INTRODUCTION

OM, like many Sanskrit words, has various meanings. This symbol is actually a sacred syllable representing the supreme consciousness or the absolute the source of all existence. The syllable OM occurs even in English words having a similar meaning, for instance, omniscience, omnipotent and omnipresent. As the cross is to Christians, the OM is to Hindus. It is made up of three Sanskrit letters, aa, au and ma which, when combined, make the sound AUM or OM. It occurs in every prayer and invocation to most deities begins with it. As the symbol of piety, OM is often found at the head of letters, pendants, enshrined in every Hindu temple and family shrines.

Repetition of OM or AUM dissolves the mind in its divine source (Gurjar and Ladhake, 2008; Gurjar *et al.*, 2008). If you chant OM several times out loud it is said to purify the atmosphere and connect you to the universal life force of all creation vibrating at the same wavelength. Before some decades, Yogis and meditating professional affirmed that chanting. mantra improves our concentration, gives peace and steadiness to our mind, reduces the mental stress and clears all worldly thoughts. Although, it's required to verify importance of mantra chanting systematically, no schemes have demonstrated yet. In this research work, we have confirmed the significance of OM chanting.

CHANTING MEDITATION

Chanting meditation means keeping a not-moving mind and perceiving the sound of your own OM. Perceiving your voice means perceiving your true self or nature. Then you and the sound are never separate, which means that you and the whole universe are never separate. Thus, to perceive our true nature is to perceive universal substance. With regular chanting, our sense of being centered gets stronger and stronger (Khalsa, 2000). However, when we do chanting meditation correctly, perceiving the sound of our own voice, we learn that chanting meditation is not for our personal pleasure, to give us good feeling, but to make our direction clear. At the moment of true perceiving, there is no thought, no separation, only perceiving sound. This is the crucial point (Andersen, 2000).

This study is a part of scientific investigations on time-frequency analysis of acoustic generated by devine sound OM (Gurjar and Ladhake, 2008).

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REVIEW OF PRIOR WORK

Since, the time of Lord Rayleigh, i.e., the beginning of the 19th century, there has been a lot of interest in studying the effect of music on the human system. It is only recently that interest has developed in extending this work to Mantras also.

Stigsby *et al.* (1981) conducted a study on the effect of mantra meditation on the electroencephalograms of experienced mediators. The results were inconclusive. Seer and Raeburn 4 conducted a similar study on the effect of meditation training on hypertension. Here also, the study showed modest reductions in blood pressure, but the results were again inconclusive.

Telles *et al.* (1994) conducted experiments on the effect of OM meditation on Middle Latency Auditory Evoked Potentials of 18 male subjects between the ages of 25 and 45 years, 9 of who had more than 10 years of experience in OM meditation and the other 9 had no experience at all. The results indicated that the experimental group showed an increase in the peak amplitude of Na wave, whereas there was a significant decrease in the control group. They extended this study in 1996, with the experimental group meditating on OM and the control group meditating on a neutral word one. Mental repetition of OM showed a significant decrease in skin resistance level of the experimental group as against the control group. There was also a reduction in the heart rate and the rate of breathing.

Takahashi *et al.* (1999) conducted a pilot study on the effect of low frequency noise on human body vibration. They showed that the low frequency noise affects the health of individuals depending on the structure of the body. The frequency range used by them was from 20 to 50 Hz, which is quite below the frequency of a normal human voice.

Heisnam Jina Devi *et al.* (2004) conducted experiments to study signal characteristics of mantra sound patterns. They showed that OM (A-U-M) signal has two segments, starting with O and gradually tapering off to M.

From the point of view of intonation and the shape and the cavity of the mouth, the sound O is in between the sounds A and U. The male voices show 9 sub harmonics in the region of O and 2 in the region of M. In the case of the female voices, these are 4 for O and 1 for M. Thus, it is clearly seen that the sound pattern for O in all cases lies between those for A and U. In the second segment, all sound patterns agree with those recorded earlier for M.

It is thus seen that attention has so far been focused on the effect of sound forms, hardly anything having been done on the structure of the sound forms or mantras.

Unless one knows the sound characteristics of mantras in detail, one will not be in a position to identify the factors, which have been found to influence the human nerve system. It is this fact, which has motivated the current study.

DATABASE

Recordings of OM chanting served as a database of this experiment. The recordings were made in a quite room at 44.1 kHz sampling rate using a close-talk microphone. All files were segmented manually. Male and female speakers of age group 30 to 40 did the entire recording in evening time after a days work before dinner by sitting in a padmasana position shown in Fig. 1, which is best position for mediation. Recording is done for about 10 min.

CONCEPT AND TECHNIQUE USED

Here, we give a brief introduction of the concepts and techniques utilized.

- Recording of the OM chant using a close-talk sensitive microphone in the windows wav format
- Digitizing the analog waveforms with the help of a MATLAB using a sampling rate of 44.1 kHz
- Start and end point detection to resize wave file
- Segmentation of complete chant into OM samples
- Spectral analysis for each OM in OM chant

The first aim is to extract the useful part from a sound file and hence for this we start with recording OM in the Windows wav format. We use PCM coding with 44.1 kHz sampling frequency. While, the file recording is affected

Fig. 1: Padmasana position

by noise and other disturbances, so, it is important to specify some threshold and resize the file after defining the start and the end point of actual sound.

SPECTRAL ANALYSIS

To view the characteristics in frequency domain, we take the Fast Fourier Transform (FFT) of the samples, between start and end samples (John and Manolakis, 1999). In order to perform this operation we use the software MATLAB, which has FFT as a predefined function. The results of FFT are used to calculate power and a plot of power (in db) v/s. frequency is taken which is Power Spectral Density (PSD). In statistical signal processing and physics the Power Spectral Density (PSD), or Energy Spectral Density (ESD) is a positive real function of a frequency variable associated with a stationary stochastic process (Rabinar and Schafer, 1993) or a deterministic function of time, which has dimensions of power per Hz, or energy per Hz. It is often called simply the spectrum of the signal. Intuitively, the spectral density captures the frequency content of a stochastic process and helps identify periodicities.

EXPERIMENTAL RESULTS

The analysis results prove that chanting OM attains the steadiness of mind. To avoid disturbances due to ambient noise or other sources of sound, a professional recording was preferred.

Therefore, a professional recording of the Divine sound chanting OM was obtained and used for further scientific investigations. During the OM chanting, our mind focuses on the repetition of OM chanting. Moreover, this practice helps us to reach steadiness. The frequency of the chant signal achieves steadiness following a continuous chanting. This specifies the attainment of the steadiness in the mind of an OM chanting person. This provides calm and peace to the stressed mind. The mental stress of a person gets reduced while the mind reaches steadiness. In addition, concentration also improves. Power Spectral Density (PSD) waveform of a single OM in an OM chant of a male and female speaker is shown below with the data statistics using linear fitting. It is clear from PSD waveform shown in Fig. 2-5, the sound OM contains equal power within a fixed bandwidth at any center frequency i.e., it resembles PSD of white noise shown in Fig. 6.
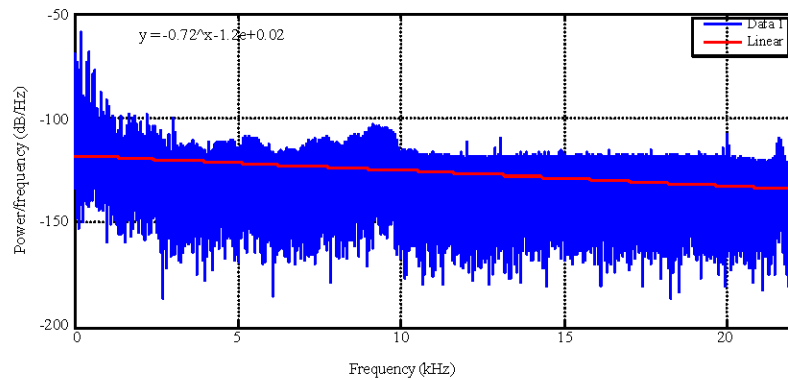
Fig. 2: PSD of sound OM of female speaker with slope of -0.72 for linear fitting
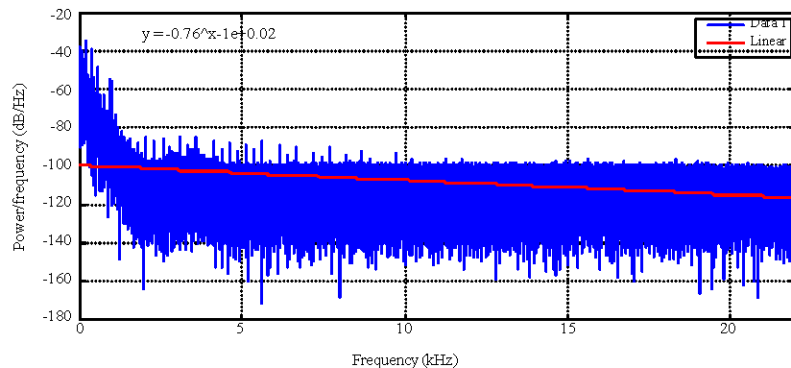
Fig. 3: PSD of sound OM of male speaker with slope of -0.76 for linear fitting
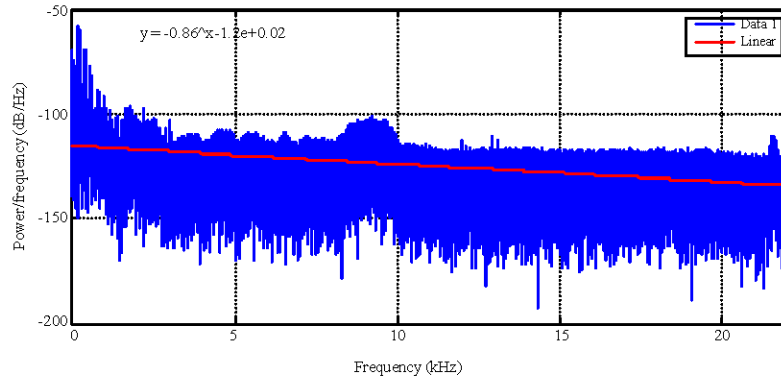
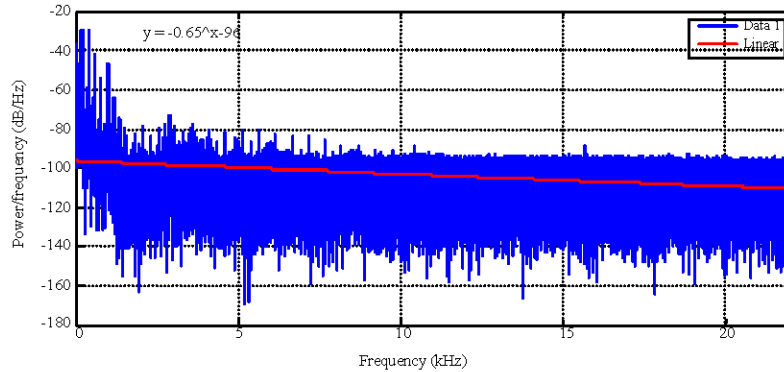Fig. 4: PSD of sound OM of female speaker with slope of -0.86 for linear fitting

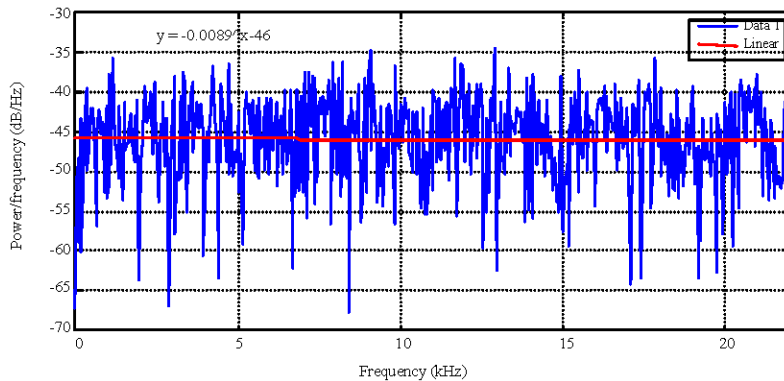Fig. 5: PSD of sound OM of male speaker with slope of -0.65 for linear fitting

Fig. 6: PSD of white noise with slope of -0.0089 for linear fitting

CONCLUSION

A flat PSD is an indication of existence of most sound frequencies in OM. Due to this reason it is commonly used to mask other sounds. As you gently allow the OM mantra to flow with the breath, the mind becomes calm. When the mind becomes calm, the body relaxes and the breath becomes even soother and slower.

That rate of speed at which the OM mantra is being repeated naturally slows down. It is not a matter of forcing the mantra to slow, but rather, this slowing comes quite naturally. Allow the mind to stay wide-awake and alert, as the OM mantra and breath become naturally slower and slower. Within minutes your mind and body begin to relax. By this analysis we could conclude stress gets minimized after OM chant.

A MATLAB code in brief to plot a PSD of white noise is given below:

```
Clear;
N   = 1000;
x   = randn (N, 1); T = 1;
t   = T*(1:N);
Fs  = 44100;
Hs  = Spectrum. periodogram;
psd (Hs, x, 'Fs', Fs)
```

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