

AN ELECTRONIC THALAM (BEAT) GENERATOR*

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Introduction

A *tala vadyam* always functions as an accompaniment in Indian concerts. Normally, any percussion instrument could play this role. In Karnatak music concerts, *ghatam* also fulfils this role. For a student learning any *tala vadya*, it is highly essential to have a periodic, steady time reference based on which he can practice different combinations of words. By 'words' we mean the multi-syllable sounds like '*Ta ki ta*', '*Ta ka dhi mi*', '*Ta ka ta ki ta*', etc. Any person having a fairly steady hand could provide this support while getting trained. Often it might become difficult to find a suitable person for providing this time reference. A simple device based on a clock mechanism could be thought of to provide this time reference. But if this device has to indicate the '*laghu*', '*drutam*' and '*anudrutam*' in the appropriate sequence depending upon the *talam* and also to keep the time reference, then the system design becomes complicated as it involves lot of mechanical logics. However this problem could be solved without much difficulty electronically. Having developed successfully an Electronic *Adi Talam* (Beat) Generator,¹ we extended the development to include the other three commonly used *talas* viz., *Misra capu*, *Khanda capu* and *Roopaka talas*. The design is based on modern digital integrated circuits which offer flexibility in system design. The instrument provides the basic beat as well as the indications of '*laghu*' and '*drutam*' in the proper sequence for the *Adi Talam* and the '*tattu*' and '*visu*' in the proper sequence in the conventional style for the *Misra capu*, *Khanda capu* and *Roopaka talas*. In addition, it offers miniaturisation and compactness. Performance results indicate that the design could be extended to other rarely used *talas* like '*Ata*', '*Khanda Tripata*' etc.

Chart 1 shows the '*laghu*', '*drutam*' and '*anudhrutham*' combinations

*Paper presented in the Seminar on Musicology sponsored by the Sangeet Natak Akademi, New Delhi & University of Madras at Madras on 28.2.1979.

CHART 1

*Thala Structure (Classical)*L = *Laghu*, D = *Dhrutam* and A = *Anudhrutam*

No.	Talam	Notation
1.	<i>Dhruva</i>	LDLL
2.	<i>Matya</i>	LDL
3.	<i>Roopakam</i>	DL
4.	<i>Jhampa</i>	LAD
5.	<i>Tripata</i>	LDD
6.	<i>Ata</i>	LLDD
7.	<i>Eka</i>	L

of the seven *talas* known in *karnatak* music. A '*laghu*' consists of a *tattu* followed by the 'stroking of the fingers'. The number of '*aksaras*' in the '*laghu*' depends on the '*jati*' of the '*talam*'. A *drutam* consists of a *tattu* followed by a *visu* and an *anudrutam* is just a *tattu* only. From the above, it follows that all these *talas* could be characterized by three performance functions, viz.,

- (1) Function P denoting the *Tattu*,
- (2) Function Q denoting the 'Stroking of a finger' and,
- (3) Function R denoting the *visu*.

On the basis of the above characterisation, *Adi talam* (*Chatusra Jati Tripata talam*) could be written in a coded form as:

P Q Q Q R R P R

In Chart 2 is shown the codes for the four commonly employed *talas* on the basis of the characterisation described above. For *Misra Capu*, *Khanda Capu* and *Roopaka talas*, codes are written based on their conventional usage.

Fig. 1 shows the system schematic. It consists of a basic time reference, a *talam* selector switch, a generator of functions P, Q and R, a programmed logic, and an output indicator which comprises a loudspeaker and four LED displays. The basic time reference fixes the beat time required, and the programmed logic depending upon the *talam* selected, enables the functions P, Q and R to be fed to the output indicator in the appropriate sequence.

In Chart 2 it can be seen that all the four *talas* start with the function P and the same function repeats in one *tala* cycle. In order to differentiate

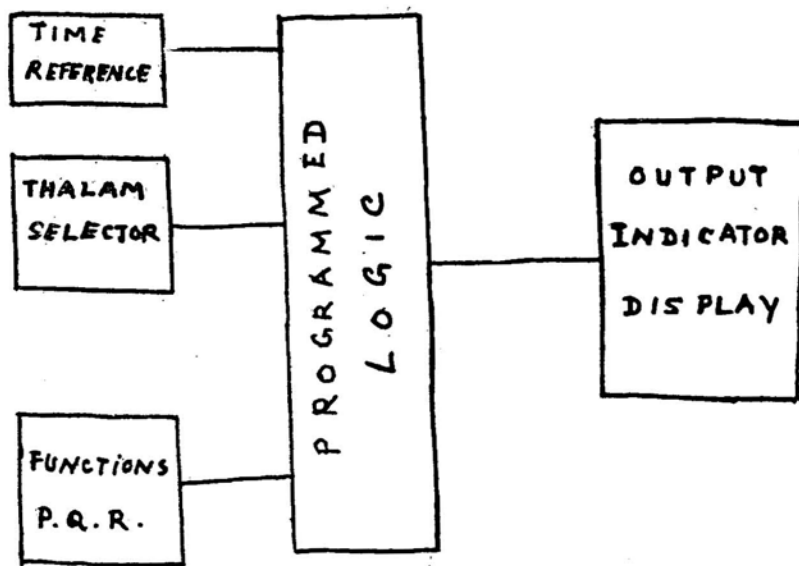


Fig. 1. System Schematic.

CHART 2

Modified Structure for Common Thalam
P = *Tattu*, Q = *Stroking of a finger* and R = *Visu*.

No.	Thalam	Notation
1.	<i>Ahi</i>	PQQQPRRR
2.	<i>Misra Capu</i>	PPPR
3.	<i>Khanda Capu</i>	PPP
4.	<i>Roopakam</i>	PPR

between the function P that comes in the beginning of the *tala* cycle, let us say P*, from the subsequent ones in a *tala* cycle, a separate colour LED is employed for indicating, P*. In the instrument four LEDs of four different colours have been used in the following way to indicate the four functions, viz., P*, P, Q and R:

- P* with WHITE LED (indicates the starting of the *tala* cycle with a *tattu*)
- P with RED LED (indicates subsequent '*tattu* in a *tala* cycle)
- Q with YELLOW LED (indicates the '*stroking of a finger*')
- R with GREEN LED (indicates a *visu*)

This facility along with the audio facility which will be explained now enables a student of *tala vadyam* to identify the beginning of *tala cycle* as well as the *tattu*, '*Stroking of the finger*' and the *visu* in a *tala* cycle depending upon the *talam* being practiced.

A Loudspeaker system provides the audio facility for the student to follow the four functions P*, P, Q, and R in the *tala* selected. In the instrument four harmonically related frequencies covering three octaves have been employed for this purpose. Whenever the function P* occurs, a combination of these frequencies, which are internally generated, is applied to the loudspeaker system. Similarly, frequencies appropriately selected from these four, are employed to indicate the presence of function P, Q and R. A special circuit enables ringing pure tones to be produced from these selected frequencies for naturalness. In essence, whenever the power switch is made 'ON' one could hear a combination of these four harmonically related pure tones occurring in a certain code sequence depending on the *talam* selected. These codes are shown in Chart 2.

The functional block diagram of the instrument developed in our laboratory is shown in Fig. 2. A pulse generator works as internal electronic clock and controls the timing sequence. Due to this, the time interval between

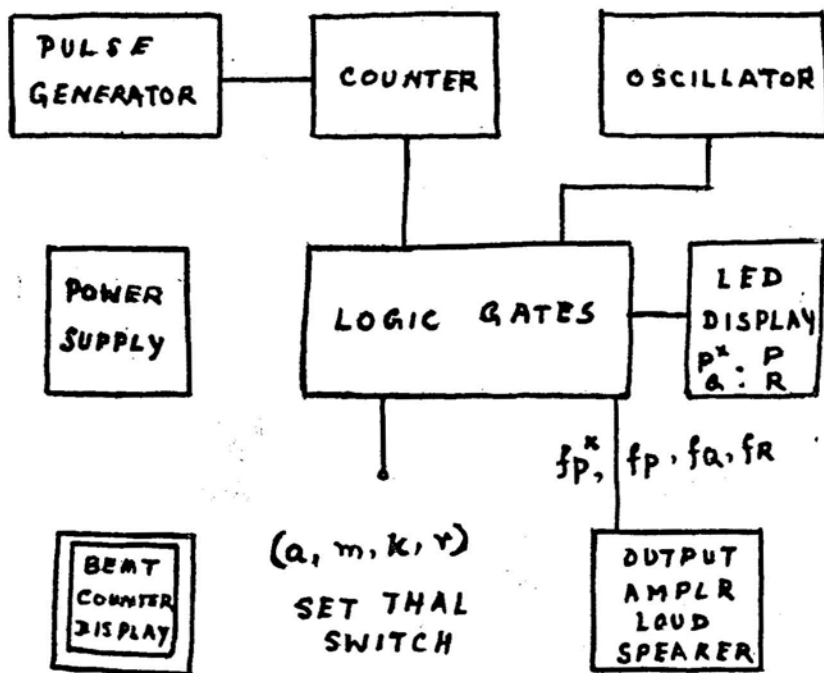


Fig. 2. Functional Block Diagram

two beats is maintained constant. Since frequency stability of the internal clock is comparatively high of the order of 10^{-4} , the time interval between beats essentially remains constant. However, in the instrument this time interval can be set with a front panel control. Once set in this fashion it remains constant till the next setting is done. An extra facility has also been introduced for providing 'double *kalai*' by the use of a front panel switch. The time interval between two consecutive beats in the normal mode could be varied from about 0.3 sec. to 3.0 secs. This gets doubled in the 'double *kali*' mode of operation.

In the present instrument, the basic oscillator produces frequencies in the range of 1000 Hz to 1500 Hz. These are used to denote the functions P*, P, Q and R as explained above. This however, could be adjusted depending upon the requirement. This frequency adjustment through the front panel control enables the artist (student) to tune the instrument to the sound generated when the black portion (*karanai*) of the *mrdangam* is stroked with the finger. Although the counter used counts upto 8, it can be further expanded upon the need. The logic gates enable the selection of functions P*, P, Q and R appropriately depending upon the *tala* setting. The output amplifier along with a ringing circuit and a loudspeaker provides the audio facility. The LEDs provide the visual indication of the functions. A regulated power supply provides necessary power. Total power consumption is less than 1 watt. Provision has been made to include a beat counter numerical display to enable the student to follow the number of *asksaras* elapsed in a *tala* cycle.

Conclusions

With this "Electronic *Talam* (Beat) Generator", it would be possible for a student of *tala vadya* to get self-trained in playing various *nadais* in the four commonly used *talas* without the help of another person to provide the basic time reference. The unit that has been fabricated is compact with minimum number of controls. The required *talam* out of the four commonly used *talas* could be selected with the help of the front panel switch. Audio and visual indication facilities are provided to identify the beginning of the *tala cycle*. Musicians employ always a *tambura* or a *sruti* box as an accompaniment to provide the basic *sruti*. This facilitates them to align their voice to the set *sruti*. It would be also possible for them to employ an instrument like the one described in this paper in concerts to facilitate them to keep the *layam* without variations like the *sruti*. After all *sruti* and *layam* are both important in a concert.

Acknowledgements

We would like to offer our sincere thanks to *mrdanga* Vidhwan Shri Karaikudi Mani for providing certain valuable information during the

design of this instrument. We also acknowledge the interest shown by Shri N.B. Subramaniam of M/s. Unique Electronics, in this development work. Our thanks are also due to the Director, CEERI, Pilani, for showing considerable interest in this work.

REFERENCE

1. Sankaranarayanan, P.E., and Meenakshi, K., "An Electronic Adhi Talam (Beat) Generator"—Paper presented in the 52nd Annual Conference of The Music Academy, Madras, 1978,