

# Exploring Rhythm, Beats, and Strokes

Shrey Mehta (200580)

**Abstract**—The primary objective of this assignment is to introduce one to fundamental concepts of rhythm, beats, and strokes. This assignment aims to practice notating the given taal and its variations based on provided audio recordings. Each audio follows a rhythm cycle with eight beats, and one is required to notate the compositions as accurately as possible.

## Understanding of audio concepts:

- 1) **Taal:** Taal is used to describe the rhythmic structure of a musical piece. It consists of a fixed number of beats or matras that are divided into sections. Each section has a specific pattern of accented and unaccented beats, which are indicated by hand gestures or claps. Taal is also the name of the cycle that repeats itself throughout the performance. There are many types of taals, such as Teentaal, Jhaptaal, Roopak, etc., each with its own characteristic features and variations.
- 2) **Beat:** Beat is the basic unit of time or pulse in music. It is the regular and recurring event that marks the tempo or speed of a musical piece. Beats can be grouped together to form measures or bars organized by time signatures and tempo indications. Beats can also be divided into smaller units, such as half-beats or quarter-beats, to create more complex rhythms. Beats can be accented or unaccented, depending on the emphasis given to them by the performer or composer.
- 3) **Stroke:** Stroke is the movement of a performer's hand, arm, wrist, or fingers that produces sound on a musical instrument. It can also refer to the sound itself or the notation symbol that represents it. Strokes can vary in terms of speed, force, direction, duration, and articulation. Different instruments have different types of strokes, such as bowing, plucking, strumming, striking, etc. Strokes can also be combined or alternated to create different effects and expressions.
- 4) **Rhythm:** Rhythm is the placement of sounds and silences in time. It is the element of music that creates a sense of movement and forward momentum. Rhythm is often described as the "heartbeat" or "pulse" of a musical piece. Rhythm can be characterized by a repeating sequence of stressed and unstressed beats (often called "strong" and "weak") and divided into bars organized by time signature and tempo indications. Rhythm can also be influenced by factors such as accent, syncopation, polyrhythm, cross-rhythm, etc. Rhythm can exist without melody, but melody cannot exist without rhythm.
- 5) **Downbeat (Sama):** Downbeat is the first beat of a measure or bar in music. It is usually the strongest or most accented beat in a rhythmic cycle. It is often indicated by the downward gesture of a conductor's baton or hand. Downbeat can also refer to the musical style or mood that is associated with slow and low-

pitched sounds. Sama is a term used in Indian classical music to denote the first beat of a taal cycle. It is usually marked by a clap or a wave of the hand. Sama is considered to be the most important point in a rhythmic structure, as it signifies the completion and renewal of a cycle.

- 6) **Tempo (Laya):** Tempo is the rate or speed at which music is played or sung. It is measured in beats per minute (bpm) or metronome markings. Tempo can affect a musical piece's mood, expression, and difficulty. Tempo can also vary within a musical piece, depending on factors such as dynamics, phrasing, style, etc. Tempo can be indicated by words such as allegro (fast), adagio (slow), moderato (moderate), etc., or by symbols such as accelerando (gradually faster), ritardando (gradually slower), etc. Laya is a term used in Indian classical music to describe the tempo or speed of a musical piece. It is classified into three major divisions: Vilambit Laya (slow tempo), Madhya Laya (medium tempo), and Drut Laya (fast tempo). Laya can also refer to the process where sounds are separated by time intervals. Performers can manipulate Laya to create different effects and variations in rhythm and melody.

## Analyzing the audio sound:

For the given audio sound and complete the notations in the table, I used the following code:

function to get the notation for the audio file

```
1 # Initialize the notation string
2 notation = ""
3 # Loop through the beats and extract the onset
  strength of each beat
4 for i in range(len(beats) - 1):
5     onset = librosa.onset.onset_strength(y[beats[i]:
6     beats[i+1]], sr=sr)
7     # Threshold the onset strength to detect the
      number of strokes in each beat
8     threshold = np.mean(onset) + np.std(onset)
9     strokes = onset > threshold
10    # Count the number of strokes and assign a
    symbol accordingly
11    num_strokes = np.sum(strokes)
12    if num_strokes == 0:
13        symbol = symbols["-"]
14    elif num_strokes == 1:
15        symbol = symbols["Dha"]
16    elif num_strokes == 2:
17        symbol = symbols["Dhin"]
18    elif num_strokes == 3:
19        symbol = symbols["Tin"]
20    elif num_strokes == 4:
21        symbol = symbols["Ta"]
22    else:
23        symbol = "?"
24    # Append the symbol to the notation string
25    notation += symbol + " "
26 # Return the notation string
27 return notation
```

**Ardh Teentaal (8 beats)**

Audio file	1	2	3	4	5	6	7	8
audio <sub>1</sub>	Dha	Dhin	Dhin	Dha	Dha	Tin	Tin	Ta
variation <sub>1</sub>	Dha	- Dhin	- Dhin	Dha	Dha	- Tin	- Tin	Ta
variation <sub>2</sub>	Dha	- Dhin	- Dhin	- Dha	Dha	- Tin	- Tin	- Ta
variation <sub>3</sub>	Dha	Dhin	- Dhin	- Dha	Dha	Tin	- Tin	- Ta
variation <sub>4</sub>	Dha Dhin	- -	- Dhin	- Dha	Dha Tin	- -	- Tin	- Ta
variation <sub>5</sub>	Dha	- Dhin	Dhin Dhin	- Dha	Dha	- Tin	Tin Tin	- Ta
variation <sub>6</sub>	Dha	Dhin Dhin	Dhin Dhin	Dha	Dha	Tin Tin	Tin Tin	Ta
variation <sub>7</sub>	Dha	Dhin Dhin	Dhin Dhin	Dhin Dha	Dha	Tin Tin	Tin Tin	Tin Ta

**Observations**

- It has been observed that the emphasis on "Dha" is much more than other beats.
- Also, the given test sounds were found to be approximately symmetric about the centre of the 8 bits regarding the spectrographic time period variations.