GAMAKA BOX NOTATION SYSTEM:
New possibilities in music education, analysis and creativity
by Jeremy Woodruff

Ethnomusicological scholarship will attest (Seeger 1958, Stanyek 2014, Kilick 2021) that conventional staff notation is not an adequate tool for the task of learning music from certain music traditions of the world, such as Arabic and Indian and Chinese music, among others. Gamaka Box notation now enables musicians to learn complex melodic movements such as are found in these music systems simply by reading notation, thanks to the assistance of a new, unambiguous system invented by composer Ramesh Vinayakam. The notation draws its name from *Gamakas*, (or *Gamaks*) the term for the nuanced, intricate movements of pitch which, along with the ascending and descending pitches in the raga, distinguish the various *ragas* of Indian music from each other. Since it differentiates the interstitial movement of melody using a clear taxonomy, it also presents new possibilities for sonic analysis which were previously not available.

The notation encompasses musical gesture (the way the *swara* does, the solfège unit of musical sound in Indian classical music). Harkening back to the medieval *neume,* Gamaka Box notation goes beyond the melodic descriptive capability of the historical conventional "note" system, which is based on static nodes of pitch. Below, an overview of the basic concepts of the Gamaka Box Notation System (GBNS) are laid out, along with some of its implications.

In most other notation systems besides conventional staff notation, solfège syllables (or sometimes numbers) are used rather than noteheads on a staff-line. In GBNS this universal system of the solfège syllable appears beneath a three-line staff. The upper and lower lines of the 3-line staff then represent the upper and lower adjacent pitch areas of the main note's immediate surrounding scale structure, respectively (or other low-to-high hierarchical structure– for Indian music they symbolize the immediate upper and lower tones of the *raga* but they could, also easily represent upper and lower proximate pitches in an Arabic *maqam*, a gamelan *pathet* or any other network of tones). The spaces above the top line and the space below the lower line represent the next higher and lower pitches in the scale structure after the adjacent ones respectively (often the interval of a 3rd–but not always necessarily, like for example in the case of the top three notes of a natural pentatonic scale it would be a 4th).

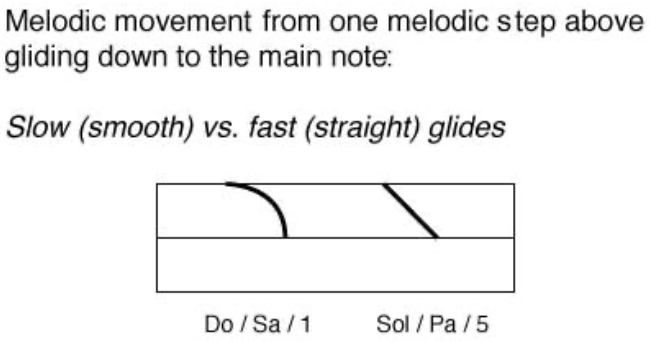

Figure 1. Basic types of pitch movement in GBNS over the pitch syllable or number

Figure 1 above therefore, shows a slow, smooth glide in pitch moving from *Re* to *Do* or a faster, straight glide in pitch moving from *La* to *Sol* (Indian solfège syllables and degree numbers are also included in this example by means of explanation, but only one is used in GBNS).

Taking the basic concept further above, an "alphabet" of symbols for melodic gesture are defined by the system based on a principle of logical mimetic graphical depiction of basic pitch trajectories through time. Below in Figure 2 are just a few of the thousands of possible forms that proliferate from a small group of main shapes in the system derived by a logic of slow and fast movement of pitch within the rhythmic unit of one syllable = one beat:

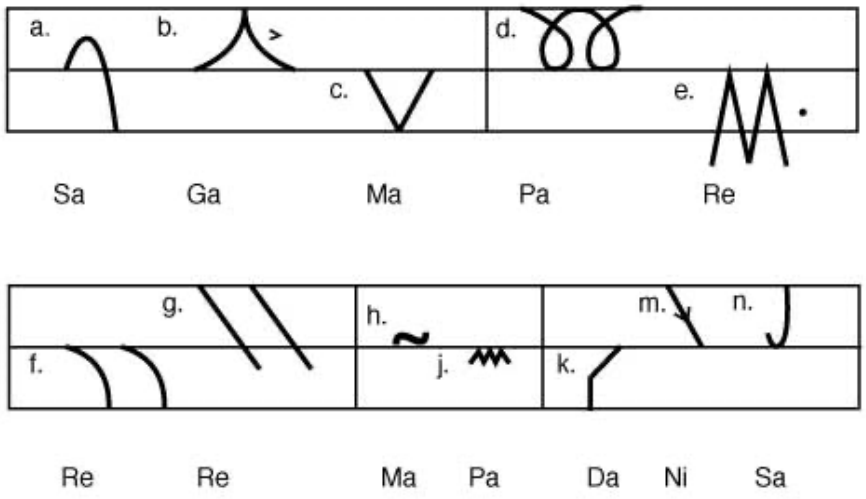

Figure 2. A rough guide through some possible gamaka (pitch movement) symbols

If you have ever tried to learn to play complex melodic nuance from a computer spectrogram-style display showing a continuous line of moving pitch, you will have probably found out why it is highly impracticable. The advantage offered by Gamaka Box notation is that a line of abstract curves and jagged movements can be broken down into a system of coherent, consistent and learnable units. Once the overall shape of an abstract line is grasped as discrete parts, the other nuances can be learned much better by ear.

Figure 2 contains the following selected symbols:
a. A single slow oscillation that goes up from the note Sa (1st scalar degree) but not quite to the next higher note, then descends to the note below Sa which is Ni (7th degree)

b. A single slow oscillation up a step to the note Ma (4th degree) from Ga (3rd degree) and back again with an accent on the middle of the descent back to Ga

c. A single fast oscillation from Ma (4th) to Ga (3rd) and back again

d. A very slow, very smooth double oscillation from the note above Pa (5th) which is called Da (6th) which ends up on Da again

e. A fast double oscillation up from a third below Ri (2nd) which is the note Ni (7th), with a staccato dot at the end which means the sound cuts off abruptly

f. A slow double oscillation in which only the descent side is heard, from the note Re (2nd) to Sa (1st)

g. A fast double oscillation in which only the descent side is heard starting from the note Ga (3rd) and descends to an indefinite pitch just slightly under the note Re (2nd)

h. a slow vibrato which goes just slightly above the note Ma (4th) in pitch

j. a fast vibrato which starts and ends just below the note Pa (5th) in pitch

k. a very fast, "struck" glide from Pa (5th) up to Da (6th)

m. a very fast lightning quick glide from Sa (1st) down to Ni (7th)

n. a very fast flick of pitch up to Re (2nd) at the end of the note Sa (1st)

"Ledger lines" (see Figure 3 below) for indicative notes show accidentals which deviate from the main collection or include pitches which are outside the span of the 6 adjacent notes around the central– middle line– note (and therefore can't simply be displayed in the space of the upper and lower lines/spaces of the box without a special indication).

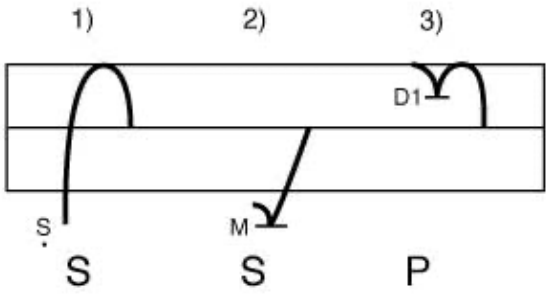

Figure 3. Ledger lines in Gamaka Box notation

In Figure 3, 1) we have a single slow oscillation from a Sa (1st degree) one octave below the main note Sa (this is indicated by the dot below the solfège symbol in this case) which goes up to the Ri (2nd) a 9th above that lower Sa and back down to the upper main Sa. In Figure 3, 2) we have quick smooth glide down to a Ma (4th) below the main note Sa which then glides quickly up to that Sa. In Figure 3, 3) in a raga which takes the note Da2 (here the major 6th) a slow glide down from Da2 to Da1 (the minor 6th) and then a single slow oscillation up again and down to Pa (5th). These ledger lines can also used inside the staff to indicate microtonal inflections and other deviations of pitch away from the main tone collection of the raga (or other harmonic context) in ways which are not demonstrated here.

The Kammerensemble Neue Musik Berlin successfully learned and authentically played South Indian Carnatic music using the Gamaka Box notation in Berlin, Maerzmusik 2017. For the first time in history there is the potential for the rules of the ragas as they are currently used to be captured with great accuracy. Furthermore, not only can GBNS be used to more accurately and efficiently transcribe and learn the music of other cultures but it also opens many new melodic possibilities for free improvisation, new music and other sonic applications.

OTHER RESOURCES:

A complete manual of usage submitted to the patent office of India:
Vinayakam, R. (2016) Gamaka Box notational system. Google patents:
https://patents.google.com/patent/WO2017125945A2/en

Woodruff, (2016) "The Gamaka Box: A Powerful System of Notation",
Sruti Magazine, India Vol. 385