Chapter 8 – Vocal music: computer analysis.

Brief summary:

- Todi raga alapana by Ariyakudi Ramanuja Iyengar
- Todi raga alapana by G.N. Balasubramaniam
- Todi raga alapana by M.D. Ramanathan
- Comparative analysis of the vocal styles

Todi raga alapana by Ariyakudi Ramanuja Iyengar

As a prelude, it will not be out of place to look at the article on Shri Ariyakudi Ramanuja Iyengar by his contemporary, Shri G. N. Balasubramaniam, who showers praise on this Master of Carnatic music as “the architect and maker of our music today”67.

Praat Analysis of the voice of Ariyakudi Ramanuja Iyengar

Thus, even as we look at a brief alapana of Todi by Shri Ariyakudi, we shall try to analyse and scientifically try to find validation of the sentences of Shri GNB

To repeat, one can look at what Sri GNB had to say about Ariyakudi Ramanuja Iyengar

- “He, it is, who has codified and adapted to modern times, the aspects of a concert, their spacing and timings-and this so well done that both the lay and the learned never have a dull moment or feeling of boredom, throughout the concert.”
- Presenting our prasiddha and Rakthi ragas in their true basic and traditional form and with their characteristic and unmistakable sancharas, sangathis and prayogas.
- The unmistakable and indispensable attributes of our classical system are its “Gamaka suddha”, the prime importance given to madhyama kala and the strict maintenance of and timely and well-proportioned admixture of Chowka, Madhya and Druta kalas, the appropriate use of the correct kala pramana and the

necessary gamakas in the phrases and the Jiva Swaras in the ragas and the usage of the “thin” and the “thick” in the Jiva Swaras of the ragas. These are exemplified very well in his style.

Todi was one of his preferred ragas for alapana in the earlier part of the concert, and this following table culls the data from 11 concerts, where the Todi raga has been elaborated as the 5th, 6th or 7th item in a concert of 16 – 20 items on an average.

![Fig 8. 1 Context, duration and other information in different alapanas of Ariyakudi Ramanuja Iyengar](image)

From the below data, we can safely infer that in the concerts where Todi was taken up by Shri Ariyakudi, he mostly chose to make it as a sub-main item, and the raga alapana was on an average 4 minutes long. Brevity and clarity were important aspects in the presentation.

Since the starts of the alapanas are very similar, we look for further indicators to the style, by detailed analysis, using the software and the methodology.

Two of the above alapanas were taken up for detailed analysis, one for ‘Koluvamaregada’ and another for ‘kali teera vandarul’
Alapana of Todi – 1 – Ariyakudi Ramanuja Iyengar

Stage 1 – Introduction - Akshipthika

s... rsndd..
g.... grr..
gmpdpm grr
r... nr. G. mnddpmgr
gmg...r... r...s...rsnd ɗ ....
Nsrg... rsnd
s.... grr.n s...rpmg...r
m....gmpmg, rr...
gmpmg...rr
gmpmgrsrgmpmgrrr...
gmpmgsrgmpdndpmanmpdmgr gmpmgsr grngmgmd mnddpmgrsn
gmpd...mp...ndpmgr

Stage 2 - Ragavardhani 1 - amsam on ma

d..p......ndpm ..mdp...gm...
sSnSpd......mp....ndpm
gmpdn....dpm
gmpd n...d...n...m... p...ndpm

Vidari 1
gmpdndpm gmpdpmpgr gmpmgsrsrgmpd...mpdp gmpm.p mg.rsn srngmpdn..dpm

Stage 3 - Ragavardhani 2 - Further amsam on ma and lead sangathis to Tara

Shadjam

d...p....pndd...mp..m. p..d.n...sndd
p....d...nSnS ndd...
pndd.mp..d n...sndd d..ndpm mdp...gm...p...d nSRS...n ndd...
nSRSn .ndd...

Vidari 2

nSRSndpmsrgnsrgmpdSRG..RSndd...
Stage 4 - Ragavardhani 3 - amsam on Tara Shadjam – Sa

R ...S... S.................n nSR...S... S.... GRR..S ....n..nSR S...RSnd...
d... dnSRG...RSnd...
G...RR...S......n n..SGRR...nS.... nG...RSnd...
dnSRG...RSnd..
dnSRGRSnd...
dnSRGRSn SRGRSrSR pdnSRGRSnd...
nSRGRSn SRGRSrSR pdnSRGRSnr SRSndnSr dmdndmgdsn dnsrgmpdnSrg..RSnd..
G...RR...S.....SGRR..n S..RGMG...RSNd...
dnSRG.....RSnd...

Stage 5 - Ragavardhani 4 - amsam on Ri

GRSnrSRG...R
GRSrdmpdndSRG...R
GG..RS nSRGrSndp dnSRGRSn SRdSR rgmpdndSRGM......GMG RGR nRn dndmgr..
ggrsngmpdndSRG...RSndd....
GG...RR...S......SGRR..n S....RPMG......R
S...R...S.... SGRR...n S....RGMG....R

Stage 6 – Conclusion - Sanchara in Tara sthayi, summing up and conclusion (Nyasam)

S...R GRR....GM.....
GMPMGRSnrSRGM.....
GMPMGRSn SRGMPDPMG RGPMGRSnr SRGMPDMP.... GM...GMPMGRSnr
S...RPMG.....R
G..RSn SRG..R
G..SRnS..nG..RSnd
dnSRGRSn
dnSRGRSnSRGmpndnSRGRSn
dnSRGRSndnSNDndnSndmgdndmngsndngspndnSrdgr.SRnS
nSp..dn..RSndp
g..dmndSnR..nGRSrdndpmsg
rgmpdnSrdndnSndpmsg.dndmgr
gmpdpmrgnmsg..nddpmsg
g...r...snnddd......n....g...srnndns.....
Alapana of Todi – 2 – Ariyakudi Ramanuja Iyengar

Fig 8.2 Graphic of Todi alapana by ARI in Wavelab, showing the 7 stages.

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total length of the alapana</td>
<td>4 min 05 sec</td>
</tr>
<tr>
<td>Context of the alapana in the concert</td>
<td>Prelude to the krithi “Emi Jesithe”</td>
</tr>
<tr>
<td>Average pause between sangathis</td>
<td>2 secs or more (allowing for violin to complete the reply)</td>
</tr>
<tr>
<td>Which speed of the sangathi occurs the most?</td>
<td>3\textsuperscript{rd} speed – i.e., 4 swaras per beat</td>
</tr>
</tbody>
</table>

Fig 8.3 Table for alapana parameters.

Tabulation of Raga Alapana stages:

<table>
<thead>
<tr>
<th>S.no</th>
<th>Stage description</th>
<th>No. of sangathis</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>5</td>
<td>27 sec</td>
</tr>
<tr>
<td>2</td>
<td>nyasam on ma</td>
<td>4</td>
<td>22 sec</td>
</tr>
<tr>
<td>3</td>
<td>nyasam on da</td>
<td>5</td>
<td>32 sec</td>
</tr>
<tr>
<td>4</td>
<td>nyasam on Sa</td>
<td>7</td>
<td>38 sec</td>
</tr>
<tr>
<td>5</td>
<td>Tara sthayi and nyasam on da</td>
<td>6</td>
<td>31 sec</td>
</tr>
<tr>
<td>6</td>
<td>Repeat Stage 5</td>
<td>5</td>
<td>23 sec</td>
</tr>
</tbody>
</table>
Detailed notation of the Alapana stages

Note: for the mandara (lower) octave, the swaras are denoted with a dot under the letter: for example: ‘ḍ’ and ‘ṅ’. In the middle octave, letters are plain, and in the Tara sthayi, the letters are capitals. First and lower speeds (karvais) are indicated by plain letters followed by dots, and second speed by the plain letters. Third speed is indicated by a single underline, and fourth by a double underline.

Stage 1 – Introduction

Stage 2 – nyasam on ma

Stage 3 – nyasam on da

Stage 4 – nyasam on Sa

| 7 | Summing up | 10 | 69 sec |

Fig 8.4 Table for the timings of various stages in the alapana.
Stage 5 – Tara sthayi nyasam on da

G…GRR...
GRS…SnS….R GMGRS… R..GRSndd...
gmpdnSRG…RSnd...
R…S……………………. SGRR…nS….
pdnSR…SnS……..nSRS….ndm ndSnGRRS…nnd
gmpdnSR……..RGRSnnd...

Stage 6 – Tara sthayi repeat nyasam on da

G…GRR..
GRS ….SnS….R GMGRS… R..GRSndd. pdnSRG……..RSndd..
dnSRGRSndpm gmpdnSRGMPMGRSndpm gmpdnSRGM….GMGRGRnRNndmgr…
grsnd ṇsgmpdnSRG…RSndd..

Stage 7 – summing up and conclusion

G..RRS........RSndm…d…nSR..S....
SRnSdnS…. S..R nSdnm..d…nGRRS..n dd…
gmdnSndd… gmdnSRSndd….dpmgr…
gmpdnSRG…RSn dnSn nGRRS..n dpm gmpdnSRG…SR nS.....
nS….p...d n...GRRSnd..p...
mgdmnSnR….R.GRSn d.ndpm gr…
gmpdnSRSnd..nSRS..R nS...
p…dnSn dpmg.....
gmpdppmgr ṇrg….ndpmgr..
g….rr…s…. s…rsnd ṃḍ ṇṣrg..r.s…ṛṇḍ ṇ…s......

Observations

- “Gamaka shuddha” or purity of the gamakas has been maintained even at 3rd speed.
- There exists very good clarity – the shape of the sangathi attempted never is in doubt, and the effort at execution is never impeded by hesitation in the mind as to the shape of the sangathi.
• Brevity in concept – the alapana stages are clearly thought out and the sangathis in the individual stages are quite brief – around 5 secs, and later they build up to long sangathis of approximately 12 secs.

• No long karvais on pure notes are seen. This style characteristic perhaps ideally suited his voice and his amazing ability to present madhyama kala sangathis (3rd speed) with clarity, one after the other in quick succession and with precise gamaka shuddham. The madhyamakala sangathis can be seen as the underlined sangathis that occur at the end of almost every stage in the alapana.

• The 3 important stages Akshipthika, Raga Vardhani and Makarini are seen in the alapana.

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Akshipthika</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stages 2 to 6</td>
<td>Raga Vardhani in stages,</td>
</tr>
<tr>
<td></td>
<td>with appropriate vidari</td>
</tr>
<tr>
<td>Stage 7</td>
<td>Nyasam</td>
</tr>
</tbody>
</table>

• The all raga stages stand out in equal clarity and conception, and truly, the description of “The Golden Mean” suits Shri Ariyakudi perfectly.

Similarly, the results of the methodology testing was used to analyse the music of 2 established vocalists,

Shri G. N. Balasubramaniam (GNB) and Shri M.D.Ramanathan (MDR)

One Alapana each in the same raga Todi taken from recordings of both artistes is shown here for analysis and study.
Todi raga alapana by G.N.Balasubramaniam

In what can be considered as epochal and path breaking, the ‘GNB’ style as it were, formed a prominent style of rendition in Carnatic music.

Balasubramaniam was born in Gudalur, a small village near Mayavaram in Tanjore, India. He was the son of G. V. Narayanaswamy Iyer, who was a keen student of music. Throughout his younger years, he observed with utmost attention the techniques of the musicians of his day. Ariyakudi Ramanuja Iyengar became his manasika (by wish) Guru and inspiration. While his father dreamed of living in a villa at Luz Church road through GNB becoming a successful lawyer. The young musician in G.N.B made way for greater goals in life. He completed his B.A. (Hons) in English Literature at the prestigious Christian College, Chennai, and took up a short music course at Annamalai University under the guidance of Sri T.S. Sabesa Iyer, but discontinued due to ill health. However, he joined the diploma course in music under Madras University in the first batch and Sri Tiger Varadachariar was the Principal. Within 2 years, he was ready for concert performances. With his debut in 1928, his climb to the dizzying heights of Carnatic music was almost meteoric. 68

The concerts in which he presented Todi raga are numerous. One such, where Todi raga alapana is presented as a prelude to the krithi ‘Emi Jesithe’ of Thyagaraja is analysed using both the Wavelab and Praat softwares.

The Wavelab analysis first clearly demarcates 7 stages in the alapana as seen below.

Fig 8.5 Wavelab analysis of various stages in the GNB alapana

Analysis by hearing, part by part, repeating and verifying the notations written by playing the music over and over again, as many of the sangathis contain swaras rendered at 4th speed.

Stage 1 – Introduction

g..grrg...... m.m..
pdpmpmg..grr.....
mgmpdpdm g..grr
s....rpmg..rs.........
s....rgsrṣ g..grrg....

Stage 2 – amsam on ma

m.m. mdsnSd dndpm grr g..ndmgrr
gm...pdpm. ppmg..grr gpmg...rsṛ rpmg..rs..
mmm.....gpmgrṣgṛ..grr..gm...
m.m...pdpm..pdpm.dpm.p pmmg
mpppmg...gṛm p..ndpm..p..dpmg..
mgmpdpmgmdp..dpmg... gpmdpmg...pmmg..pmmg..rsṛ
ss.....dpm..pmmg..grrs rpmg...
mm...pdpm.mdp..gm...npd...

Stage 3 – amsam on pa

p..nnd..p...
dp.....pdnd..ndpnmdp...gm...
m..npd......dg....
gmpdn..d nddp...d
p.dnd..ndpm..
Stage 4 – amsam on da

n..ndd nddSnnddpdnpn..ndd
dm..dnSnnddp mnd..nddm..d gm p..dnSd..pnd..d
dp..d nSndp p..ndd.p .dpmg..m p..dn..d
dp..dn..dSnndd n..nddm dnSnndd..pnd..d
.n..mdnSd..dnp..dnSndp..p.dnd.ndpm mdpp..gm pdnSd..pnd..d
.n..dn nddm ndmrgmndm nd.. ndmrgmndmndn
dndn dnSnndd..dnm dnSnndd..Snmm dSnndd..dSnnng gmdnSn..Snnd mdnd..ndd..m
dnSn..Snnd
dddn..RSnndd..dd..n..RSnd
dnSnRsndnSndpdpn..dm...
d..dnSRSn..RSndd

Stage 4 – amsam on Sa

dpdnSRS..dpdnSRS..S...
RSnSRS..RSRS..nndd
.d..d dnS..RSSn..nSRS..RSnd
d..n S..RSn nSRS..R SndSnS..S..RSnd dnS..Sn..Snnd..ndo..d..n..RSndn..d
d..dnS..RSnd
mdnSRS..RSd nSRS..RSd
nSRS..RSd
nSRS..ndm dnSRS..RSd
nSRS..R dSnSn..dmnddm..m d.. nSRS..RSd
RRSnddpdpnS.. RRSnSRSnddpdnS..RRSnSRSnSRSnSRSnSRSnddpdnS...
RRSnSRSnSRSnSRSRS nSnSnd ndS ndS Snd.. mdn..d.. dnS..n nSRSnSndpS...
RRSnSRSnSRSnSnd Snd ndS ndS ndS ndS ndS ndS pdppnddSnnRSS.. dpdm pdnS...
RRSndmp.d.nS..
dnSRSn dnSRSn dnSRSnSndp..p.d.nS...
dnSRSn dnSRSn dnSRSnSnd mndSnSndSndSndSnddmSndmSndmSndmSndmSndmSndmSndmSndmSndmSnd...gmdndmg mdnSnSndm dnSRSnSndpmp.d.nS...
p.. dnSRSnSndpm p.d.nS...
dpS

156
Stage 6A – nyasam on Ri

d.d.d. nSRG…R
G…GRR…
R.R.R………..MG G…R
R.R.GRRN RPM G…M G…R
S.S.S……. RPM G…..R… S…
S.S.S…..RMGM S… RPM G…..R… S…
S.S.S….. R_ RMGM ….GRRN R.._RPM G…..R… S…
S.S… RGM…S…
RSRGM…..S…

Stage 6B – nyasam on Ma (mostly in 3rd speed)

RGM…
RSRGM…GMGRSndnSRG M..S……
RSRGMPMGRSndnSRGM..S……
RSRGMPMG RGMGRSGr nRGMMPMGRS nSRGMMPMG R..S……
nRGMMPMGRS nSRGM…RGM…GRGM…GRSnSRGM……
RMGM…GRGM…GRGM…GRnRGM…GRndm…gmdnRGM……
MGMRGM..nRGM..nRGM…RGM…dnRGM…
RGDMGRRdmgmrdnR GMGRGRRmdmgmrdngmrdnRGMtRGDMGR
 ..RGNdRGMtRGDMGR…
R.R.R.G…….RPMG…R
S.S.S….. RGMP…MG….RS R.._RPM G…..R… S…
S.S.S…..SDDPPMG…RSRPMG…RS……

Stage 6C – summing up (mostly in 3rd speed)

S.S.S… R_ RPM G…..R… S…R…GRSndd…
dnSRG…S ….. R…GRSndd…
dnSRG…d… dnSRG…S ….. R…GRSndd…
dnSRG RSndd…
dnSRGRSndmpdnSRGRSndd…
dnSRGRSn SRGRSd dnSRGRSndpmp gmpdnSRSnSndpm
gmpdnSRGRSndpmp gmpdnSRGRMPMGRSndpm
gmpdnSRGRGM…GMGRSndpm gmpdnSRG…R..GRSnd..ndpmgr
 gmpdnSR.NSRS dnSn pdnd mdpd gmpm grs….

Stage 7 – conclusion

s.s.s…s_MGM MSR_ RnS….
Shri GNB has also shown his genius, stamina, versatility and deep thinking by presenting Todi raga in a very big and magnificent manner as a 32-minute alapana. This duration excludes the time taken for the violinist to give his reply for the various stages. The alapana is also appended for perusal. The salient features of this are:

<table>
<thead>
<tr>
<th>S.no</th>
<th>Stage description</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>3 min 40 sec</td>
</tr>
<tr>
<td>2</td>
<td>Nyasam on ma</td>
<td>7 min 23 sec</td>
</tr>
<tr>
<td>3</td>
<td>Nyasam on pa and da</td>
<td>11 min 22 sec</td>
</tr>
<tr>
<td>4</td>
<td>Tara sthayi elaboration and summing up</td>
<td>13 min 5 sec</td>
</tr>
</tbody>
</table>

Fig 8.6 Tabular analysis of various stages in the 32 minute GNB alapana

**Observations**

- In a 10 minute alapana of 7 stages, the traditional method of 3 parts – introduction, body of the alapana in stages, and conclusion has been followed.
- Sangathis (phrases) are not confined to any one speed alone, even at the beginning – they are generally a mix of various speeds. This is a distinguishing and unique feature of Sri GNB’s style.
“Gamaka shuddha” or purity of the gamakas has been maintained even at 3rd and 4th speeds. The conception and the ease of execution of some of the phrases, especially in stage 6B are simply put – breath taking.

There exists very good clarity – the shape of the sangathi attempted never is in doubt, and the effort at execution is never impeded by hesitation in the mind as to the shape of the sangathi.

Brevity in concept – the alapana stages are clearly thought out and the sangathis in the individual stages are quite brief – around 5 secs, and later they build up to long sangathis of approximately 12 secs.

Some long karvais on pure notes are attempted. This style characteristic perhaps ideally suited his voice and his amazing ability to present very fast madhyama kala sangathis (3rd speed) with clarity, one after the other in quick succession and with precise gamaka shuddham and interspersed with flashes of brilliant inspiration in 4th speed.

The novelty of concept of many speeds in a single sangathi, and ease of execution of the sangathis and the all-round perfection in the codified approach to the raga are the hallmarks of this style.

Todi raga alapana by M.D.Ramanathan

When the 2 styles of Ariyakudi and Sri GNB are analysed, then all other styles seem to be either a sub-set of the two masters. But, there were many others, including Madurai Mani Iyer, Semmangudi Srinivasa Iyer etc. who presented entirely original approaches in their music. Yet another “original” musician was the disciple of Tiger Varadachariar, Shri M.D.Ramanathan.

In the words of a prominent art critic, SVK,69 “The style of M. D. Ramanathan has relevance today when speed, scales and swaras are the ruling motivation of musical aesthetics. MDR’s marga in music was entirely different from even those of his contemporaries. The superiority of sampradaya, tracing inspiration to Patnam

69 http://www.carnaticcorner.com/articles/mdr2.htm
Subramanian Iyer through Tiger Varadachariar stood out as the polestar of MDR’s objective."

Wavelab analysis of the alapana gives the following graphic:

Fig 8.7 Wavelab analysis of various stages in the MDR alapana

The raga alapana is seen as 3 distinct stages, and a striking feature of the above graphic is that the gaps between one phrase and another are quite large, as when compared to the graphical representation of alapanas by Ariyakudi or by GNB. This can also be inferred from the fact that the violin almost always repeats the phrasings in entirety.

Presented below is the small (less than 4 min) duration alapana of Shri MDR, as he was called popularly. The distinguishing feature is the smooth and slow and well-modulated and expressive approach of this master musician.

Stage 1 – Introduction

g.r.s.... s...s. n ṇdḷ.....
rsṇṇḍḍ .. ḍg.....grr....
grgr..gmndd mnddmg..grr..
gmndd mdmm..grr
gmndd nSndmg…grr …g.....ndpmg..grr.....
psmg...rs.....
s....s.....s..rg rsndd..dg...grr
rsrgmdnsRGMR..GRndd mdnRndmgr mdnRndmgr...
gmndp…dpmp..gm p..dndnSRSnd..
Stage 2 – Vidari using the d – G range in Madhya - Tara sthayis – constant

Nyasam on d.

dmd ..dnSR....S.......RRS......n nd
dnSRS....Sn dnS...RS  SnSn dpm
dmd.. mdn... d dnS..n RSnd..
RSndpmd...dnSRS....
RSnd nRRSn dpmd..nSR..S..nndd...
ddG..GRR........ RnR.. GM..GRR..GM..GRR....GR...S...
SnSR SRG,S....RG  RSndd
ddG...GMGR RSn

Stage 3 – Conclusion

ddG...RRGRSn.....
ddG...RRGRSndnSRSnd.....dnndmgr...
g..rr n...dd dG..nRGRnd mdRndm gmSndmg..rs
ss...SS..S...p..dp dnS..nRS..n d..p..
m..mdp...g m... gmndpd...
dnSRSn..RSn...Sndpmd...d.. d..
d...n S..n RS.........RSndmd.....n..RS...

Observations

- “Gamaka shuddha” or purity of the gamakas has been maintained and the alapana proceeds at 2nd and a sedate 3rd speed. 4th speed brikas (fast phrases) are almost completely absent.
- There exists very good clarity – the shape of the sangathi attempted never is in doubt, and the effort at execution is never impeded by hesitation in the mind as to the shape of the sangathi.
- Brevity in concept – the alapana stages are clearly thought out and the sangathis in the individual stages are brief.
- Long karvais on pure notes are seen. This style characteristic perhaps ideally suited his voice and his amazing ability to present the sangathis with clarity and repose.
- All raga stages stand out in equal clarity and conception, and truly the elusive ‘Lakshaya’ or the aesthetic of the raga has been captured by this master musician.
The words of the critic “relevant style” and “different marga (path)” – with reference to speed and aesthetics are borne out by this analysis.

**Comparative Analysis of Vocal styles.**

Fig 8.8 A random Todi phrasing by Ariyakudi Ramanuja Iyengar

Fig 8.9 A random Todi phrasing by G.N.Balasubramaniam

Fig 8.10 A random Todi phrasing by M.D.Ramanathan
The images above show the computer analysis of phrasings in Todi raga, as sung by Sri Ariyakudi, Sri GNB and Sri MDR.

Due to the limitations in the Praat program, the above diagrams could be obtained with difficulty and also the superimposition of the SSG grid was not as successful as in the case of the analyses for Veena or even the Violin.

The limitations could be basically due to the low pitched nature of the voice and the technicalities involved in separating the constant upper octave- high pitched tone of the violin that occurred most of the time, as a support to the vocalist.

Hence the following conclusions have been drawn:

- Using the software, the general voice characteristics can be compared. The voices are analysed for the general characteristics like formants and spectral analyses. The following inferences are made:
  1. Ariyakudi: - Relatively higher pitched voice, and hence the clarity as seen in the presence of the fifth formant
  2. GNB – Medium pitched, relatively speaking, and presence of strong 3 formants, but total absence of the fifth formant – maybe be a voice characteristic, but also could be attributed to data loss due to improper compression as mp3 files in the recording.
  3. MDR – Much lower adhara shruthi. Also, 5 formants are seen, but the first formant is prominent and to a lesser extent, the second formant. This explains the instant recognition of the voice, even to a layman.

- The general intensity levels of the voices and variations of the level during the raga phrases are compared.

- General tempo of rendition and the various gamakas used for similar phrases can be compared.
  1. Ariyakudi – The prominent characteristic feature that can be inferred is that the raga alapana sangathis were mainly in a relatively fast “madhyama kala” tempo. Slower tempos have been kept to the minimum,
and there are fewer phrases that can be characterised as “karvais” or long drawn shuddha swaras.

2. **GNB** – The graphics clearly show the presence of fast tempo in the raga alapana sangathis. Some sangathis also show the presence and change in the tempos within very short periods of time. This unique feature of this artiste, which was well thought out and well executed made this style very noticeable.

3. **MDR** – The graphics show that the general tempo, average time length and also the pauses between phrases of a phrase was characteristically much slower than the previous 2 artistes. This feature, in conjunction with the unique tonality in the voice, made this style stand out distinctly.

In the future, with advances in the Praat program, and a better and intuitive approach to the parametric involved in the analysis, it is possible with the program to further study the tonal characteristics of the voice, leaving out the constant accompanying tone of the violin, the accuracy in note rendering, both in terms of shruthi (melodic) and laya (rhythmic) perfection, the conceptualisation and use of the gamakas according to the context (arohana or avarohana) and also notate the music to a greater degree of accuracy than by mere hearing, and thus also come to firmer conclusions about the fidelity to Raga Lakshana.

Due to technical reasons, the scope of such analyses is limited, and the previous method of notating by hearing the music repeatedly using the ‘slow play’ and ‘repeat play’ and ‘fast play’ features in the Wavelab program is relied upon.

Notation analysis has helped to show the akshipthikas and the vidaris etc., and thus conclude that for all the 3 Vocalists, their raga alapanas were deliberately based on the kriti that was to be sung.

The results clearly indicate the significance of the description the Golden mean’ for Sri Ariyakudi, ‘Electrifying brikas and exhaustive creativity’ for Shri GNB and the ‘Introspective and reposeful karvais” for Sri MDR.