Musical Informatics:
Analysis of the Architecture of Carnatic Music for improvisation in Jazz/Western Classical music.

Ramakrishnan Subramanian:

South Indian classical music is called Carnatic Music, one of the two streams of Indian classical music, the other being Hindustani Music.

Carnatic music has always been expressed through traditional Indian classical instruments like the Veena, violin and mandolin. But it provides great scope for expression on western instruments like the guitar and saxophone as well. My aim has been to compare the theory of Indian carnatic music to Western classical theory and western music theory. Over the course of this paper I would like to explain the concepts behind carnatic theory and how it can be incorporated with other western musical styles like Jazz and blues to provide for new musical expressions. This includes an in-depth look at the architecture of the theory behind Carnatic music. I have expressed my thoughts on how certain musical expressions can be incorporated into western musical forms. I have drawn inspiration from certain artists who have taken steps towards experimenting with combining elements of the two musical forms.

The basis is, as in any musical form, the concept of pitch and rhythm.

**Solfege System:**
The solfege system in Carnatic music is different from Hindustani and Western Musical forms.

The seven solfa syllables in Indian Carnatic music are illustrated in comparison to Western and Hindustani music.

<table>
<thead>
<tr>
<th>Western</th>
<th>Carnatic</th>
<th>Hindustani</th>
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<tbody>
<tr>
<td>Do</td>
<td>Sa</td>
<td>Sa</td>
</tr>
<tr>
<td>Re</td>
<td>Ri</td>
<td>Re</td>
</tr>
<tr>
<td>Mi</td>
<td>Ga</td>
<td>Ga</td>
</tr>
<tr>
<td>Fa</td>
<td>Ma</td>
<td>Ma</td>
</tr>
<tr>
<td>Sol</td>
<td>Pa</td>
<td>Pa</td>
</tr>
<tr>
<td>La</td>
<td>Dha</td>
<td>Dha</td>
</tr>
<tr>
<td>Ti</td>
<td>Ni</td>
<td>Ni</td>
</tr>
<tr>
<td>Do</td>
<td>Sa</td>
<td>Sa</td>
</tr>
</tbody>
</table>
This is the basic solfege that is used in Carnatic Music. Seven syllables are used, similar to the western musical system.

**Ragas and Talas:**

Ragas and Talas are two major aspects of Carnatic Music. The Raga refers to the harmonic universe and the Tala refers to the Rhythmic universe. The Raga is similar to the concept of Scale in Western music and the Tala refers to a particular time signature (beat).

Every composition or improvisation in Carnatic Music is based upon a certain Raga and a certain Tala. It is in certain contexts similar to a jazz composition, where the lead instrument plays over a certain chord progression and then chalks out melodic lines while keeping up with a certain beat (time signature). The phrasing is based upon a certain rhythmic pattern or pace that is universal and followed by every instrument. In carnatic music the concept of harmony is not as evident as in Jazz or other forms of Western music.

**Harmony:**

What is harmony??

Harmony can be defined as the simultaneous occurrence of multiple pitches or in more technical terms, a chord in western music. Harmony is symbolized by counterpoint and polyphony in western music. A choir is a perfect example of harmony. Harmony provides a new dimension to music.

The concept of harmony is almost non existent in Carnatic Music.

In Carnatic music, the improvisation is always linear over a raga over a time structure known as a Tala.

**Deeper Into Ragas:**

I would like to explain the concept of the Ragas more. Consider the basic major scale in the tonic of D. As per the interval formula in western theory the notes in the Major scale are

D E F# G A B C# D.

There is a raga in Carnatic music called *Sankara Bharanam* which consists of the exact same notes as the D major Scale. But after listening to a composition in the key of D major and to a carnatic composition in Sankara Bharanam, one can clearly find that there is a pretty evident difference in the way both forms represent and characterize themselves.
In *ragas*, there exist certain inflections or ornamentations that are referred to as *ghamakas* in Carnatic Music. It does not sound similar to the major scale though it is based on the major scale. This is because the ghamakas offer a completely different dimension sonically to the composition. The ghamakas characterize the raga and this is one of the biggest differences between ragas and scales.

In Western Music when one has to improvise on a scale, it is enough if one stays diatonic to the scale. The intervals do not really matter as long as you stay diatonic to the scale. And improvisation leads to new melody lines.

In carnatic music, improvisation has a more disciplined structure. It is almost as if you are bound to certain rules, i.e. in order to play one note which you think may be musically pleasing, you have to play another in order to get to it, therefore giving you a new sonic dimension during expression.

There are 72 seven note ragas, called *Melakarta* ragas. The number 72 is arrived by a combination of the notes that are used in Carnatic Music. In Western Classical notation the diatonic scale consists of seven different notes with the first and fifth being unique. Every other note, the 2,3,6,7 have two variations: the minor and the major, each having a definite interval from the root (tonic). The fourth also has two variations but it is referred to as more the augmented fourth (diminished 5th) and the perfect fourth. In Carnatic Music the Ri, Ga, Dha and the Ni have three degrees of variation and though some overlap (as explained in the Table below) it is a rule for a melakartha raga that it must have at least one of these, thereby creating 6 * 6 * 2 = 72 melakartha ragas. (6 Ri, Ga variations) and (6 Dha, Ni variations).

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<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>Sa</td>
<td>C</td>
</tr>
<tr>
<td>2</td>
<td>Ri(R1)</td>
<td>C#/Db (minor 2nd)</td>
</tr>
<tr>
<td>3</td>
<td>Ri(R2)Ga(G1)</td>
<td>D(major 2nd)</td>
</tr>
<tr>
<td>4</td>
<td>Ri(R3)Ga(G2)</td>
<td>D#/Eb(Minor 3rd/Augmented 2nd)</td>
</tr>
<tr>
<td>5</td>
<td>Ga(G3)</td>
<td>E(major 3rd)</td>
</tr>
<tr>
<td>6</td>
<td>Ma(M1)</td>
<td>F(perfect fourth)</td>
</tr>
<tr>
<td>7</td>
<td>Ma (M2)</td>
<td>F#/Gb(augmented 4th)</td>
</tr>
<tr>
<td>8</td>
<td>Pa</td>
<td>G(perfect 5th)</td>
</tr>
<tr>
<td>9</td>
<td>Da(D1)</td>
<td>G#/Ab(minor 6th)</td>
</tr>
<tr>
<td>10</td>
<td>Da(D2) Ni(N1)</td>
<td>A(major 6th)</td>
</tr>
<tr>
<td>11</td>
<td>Ni(N2) Da(D3)</td>
<td>A#/Bb(minor 7th/augmented 6th)</td>
</tr>
<tr>
<td>12</td>
<td>Ni(N3)</td>
<td>Major 7th(B)</td>
</tr>
</tbody>
</table>

There are some ragas in Carnatic Music that are not so commonly found in Western Music.
These are ragas that have similar ascents and descents i.e. the same notes are sounded in either case

*Pantuvarali:* D D# F# G# A A# C# D.

Harmonically this scale offers for improvisation with the following chords.

D major/ Eb Minor /F# minor/major /G# sus4/ Ab5 and some other suspended voicings.

*Bitonal concept:* There exists an F# major pentatonic in the scale. This offers great scope for improvisation in a western music context. Over the tonic which is D, melodies in the key of F# major can be layered provided that the melody line resolves to the tonic or the fifth at the right moments.

*NasikaBhushani:*

D E# F# G# A B C D. This is a unique raga that can be used in a blues context since we have the minor 3rd/augmented 2nd and this offers scope for exploration in western musical forms.

The second scale degree is distinct from the third scale degree, which is the reason for not naming it an F, and calling it an E#.

We should also note that pitches in Carnatic Music are not exactly tempered.

*Vagadeeswari.*

D E# F# G A B C D. The way it is different from the earlier one is that this raga includes the perfect fourth and not an augmented fourth as in the earlier raga NasikaBhushani.

A combination of the two ragas can be used in a very diatonic context to solo and create melody lines in blues progressions, appropriately shifting between the two and resolving to the right notes when necessary.

*Maya Malava Gowlia.*

D D# F# G A A# C# D

This is again similar to the first raga that we discussed Pantuvarali, except we encounter a perfect fourth in this raga while having an augmented fourth in the previous case.
A few more Melakartha ragas are illustrated in the table below.

<table>
<thead>
<tr>
<th>Raga</th>
<th>Scale</th>
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<tbody>
<tr>
<td>Latangi</td>
<td>D E F# G A A# C# D</td>
</tr>
<tr>
<td>Simmendra Madhyaman</td>
<td>D E F G# A A# C# D</td>
</tr>
<tr>
<td>Sarasangi</td>
<td>D E F# G A A# C# D</td>
</tr>
<tr>
<td>Ramapriya</td>
<td>D D# F# G# A B C D</td>
</tr>
</tbody>
</table>

Each of these ragas offers an interval pattern that is not commonly used in western compositions. They can be experimented with by just staying diatonic to the scale and the ghamakas (ornamentations of the ragas) need not be necessarily adhered to.

**Janya Ragas:**

Derivatives of Melakartha ragas but have different ascending and descending modes. I have illustrated a few sample ones below.

**Bilahari:** Ascends on a D major Pentatonic (D E F# A B)  
: Descends on a D Ionian or the normal major.

**Abheri:** Ascends on a D minor pentatonic (D F G A C)  
: Descends on a D Dorian mode (D C B A G F E D)

**Saramathi:** Ascends on a D minor and descends on a G minor pentatonic.

Now this proves to be very interesting in terms of how improvisation can occur because in western music, though there is a lot of distinction between the minor pentatonic scales in the respective tonics of D and G, in carnatic music the G minor pentatonic is in fact a variation if the minor pentatonic in the tonic of D.

There also exist other janya ragas which have interesting ascent and descent modes but exploring each and every janya raga is beyond the scope of this paper.

**Microtones:** When an interval to a note is less than a semitone it is In Carnatic music the octave is divided into 16 sruthis or pitches. It is difficult to play all these pitches on a tempered instrument. Therefore these microtones can be sounded by sliding between the notes on a tempered instrument. These expressions that refer to the transition between the notes are referred to as ghamakas.
**Mode - Raga chart:**

Note that only the scale structure of the raga may correspond to these basic modes. The similarity ends right there.

- Ionian -> Sankarabharanam
- Dorian -> Karaharapriya
- Phrygian -> Thodi or Sindhubhairavi
- Lydian -> Kalyani
- Mixolydian -> Harikambodhi
- Aeolian -> Natabhairavi
- Locrian -> No equivalent

**Talas and Rhythms.**

The Tala is a rhythmical pattern that defines the rhythmical structure of a Carnatic music piece. The terminology used in the description of Talas is very complex and the structure of each Tala is very unique. Given below are some implementations of three note and five note cadences in Carnatic music.

The clap is the basic description of the tala and the singer usually follows a pattern in which each finger of the hand makes contact with the lap so as to give a cue as to which beat they are currently in.

I have illustrated a few cadences below, examples by one of the leading Carnatic fusion players, Prasanna. These can not be used not necessarily in the context of cadences but instead of having rests on the the first three beats, they can be filled in with other musical expressions.

The examples below have cadences in groupings of three and five and they offer a lot of scope for experimentation.
Cadences using odd groups

Groupings of Three

Double Unit Cadence

Unit 1

Unit 2

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Cadences using odd groups

Groupings of Five

Double Unit Cadence

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Conclusion: After exploration of the rhythmic concepts and the concept of ragas, I find there to be great scope for collaboration between the two musical forms. Both forms have uniqueness in what they offer to the collaborative musician. Both musical forms have been a great source of musical inspiration but it is the possibility of combining both musical forms that serves as the greatest inspiration. My journey to exploration of this form of fusion/world music has just started and I wish to build on this further.