Computational Jazz theory applied to Contemporary, Tonal and Atonal Guitar

A new approach to the study of improvisation, information technology-aided.

For Advanced Players only!
For guitar but adaptable to all instruments.

Some creativity required!
Warning: Knowledge of position playing is a prerequisite.

Gabriele D'Angela
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Preface

The aim of this book is to provide to the musician a way of approaching the vast pitch material that the chromatic palette of the well-tempered system can offer for the purpose of melodic and harmonic creation with a vision that emphasizes ulteriorly the development of chromaticism and formal aspects in musical improvisation and composition.

A fundamental step to gain technical control of these resources is the organization and the catalogization of the materials that cannot be static but must be dynamic. According to this concept, the approach must include a computational capacity that consent a temporary and fast visualization of the permutation possibilities of the actual patterns the researcher is trying to develop and absorb.

This volume shows a first way, as an example, of approaching all the instrumental possibilities of patterns in K4 extracted from the chromatic/pan diatonic system in C and a way of approaching through segmentation and permutation atonal improvisation starting with the investigation of 12 tone series and segmentation of the aggregates in patterns of K3.

It means all the basic 4 notes patterns that can be found in all the possible modes of C, compressed in one octave.

I will also introduce in this volume some good procedures to start developing this vast material in an organized way. I will call these techniques melodic expansion techniques (MET).

An example of basic MET that will be introduced in this volume are:

MET 1: Octave dispersion
MET2; Alla Ottava repetition
MET3: 12 tonic expansions
MET4: Modal substitution replacement
MET5: Rhythm superimposition models in eight notes.
MET6: Cyclic Permutation

Try to play this phrase that I improvised basing my attention on 4 trichords-derived from the chromatic scale:
Chapter 1

The « Algorythm » ABCDEF

A) The first, important step the researcher must undertake, according to my methodology, is to learn how to computate and print all the permutations of the pattern he is going to investigate. I call the table obtained through this procedure, the “mother colour palette“(mcp). This procedure can also be applied to trichords-derived or any pitch set.

The fore mentioned is the main point of this method and it can be accomplished by learning how to use an online or dedicated calculator for permutations. Even better would be to be able to manipulate scripts or snippets concerning the subject, or even writing your own software, something I will perhaps write about in the next volumes.

The second important point is to use a musical engraver to get in music notation all the results obtained from the foregoing described procedure,

B) Select one pattern from the total mcp.

C) Find all the possible position playing fingerings first for each pattern in one octave; in the next volumes, we will see all the other methods too.

D) Practice them on the instrument repeating each pattern cyclically, 2 times or more (each of the possible fingerings 2 times).

E) Select a harmonic progression and modulate a selected pattern or combination of patterns through the use of the MET3 using the modal substitution replacement “chart” (MSRC), in position or moving through positions later on.

F) Further development using the MET.
A picture is better than one thousand words.

Let's take a look at the MCP of C (Ionian) that I already have developed on page 5.

A) MMP = C major scale in K4: (see page 5)

B) Pattern number 1 selected; CDEF.

C) To find all the "position playing" fingerings possible, each time you play the pattern, start using subsequently finger 4 then 3, 2 and then 1 for the first note. The remaining 3 notes of the pattern will adopt the correct “position playing” fingering of the moment that will come automatically. If you are not an advanced player and you have any doubts as to what the correct position playing of the moment is, you should probably check out the traditional methods of position playing or try to get a copy of my out-of-print DNA book.

The example given is focused on string (6), continue on the remaining strings in the same way.

D) Progression selected: || Cmin7 | Ebmin7 | F#min7 | Amin7 11

Example given only starting from string (&), continue on all the remaining strings in the same way. Continue reading to understand how the following patterns were developed through the MSRC.

E) Here I give an example of MET5:

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Another example using MET6 + MET1 (bar2), MET1 (bar4):

As you can see from the last example, the MET techniques can be combined.
What follows are all the possible pitch sets in k4 from the scale of C major. Here is the “mother color palette” in alphabetic notation.

MCP for C major Scale

840 total Permutations (n=7, k=4), 120 from each scale degree.

Starting from pitch c

\[ \begin{align*}
\text{c} & \text{ d} & \text{ e} & \text{ f} \\
\text{d} & \text{ c} & \text{ e} & \text{ g} \\
\text{e} & \text{ d} & \text{ f} & \text{ c} \\
\text{f} & \text{ e} & \text{ g} & \text{ d} \\
\text{g} & \text{ f} & \text{ c} & \text{ d} \\
\text{a} & \text{ b} & \text{ c} & \text{ d} \\
\text{b} & \text{ a} & \text{ c} & \text{ e} \\
\text{c} & \text{ b} & \text{ a} & \text{ d} \\
\text{d} & \text{ a} & \text{ b} & \text{ c} \\
\text{e} & \text{ c} & \text{ b} & \text{ d} \\
\text{f} & \text{ d} & \text{ c} & \text{ e} \\
\text{g} & \text{ e} & \text{ d} & \text{ f} \\
\text{a} & \text{ b} & \text{ e} & \text{ d} \\
\text{b} & \text{ c} & \text{ e} & \text{ a} \\
\text{c} & \text{ d} & \text{ e} & \text{ b} \\
\text{d} & \text{ e} & \text{ f} & \text{ a} \\
\text{e} & \text{ f} & \text{ g} & \text{ b} \\
\text{f} & \text{ g} & \text{ c} & \text{ a} \\
\text{g} & \text{ a} & \text{ b} & \text{ c} \\
\end{align*} \]

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Starting from pitch e

\[ e \text{ c d f } f e d g \text{ g e c d a } c e d b \text{ e f d e c f g e c f a e c f b e c g d e c f a e c g a e c g b e c a d e c a f e a g e c a b e c b d e c b f e c b g e c b a e d c f e d g e e d c a e d c b d e f d e g f d e a f d e b f d g c f d g e f d g a f d g b f d a c f d a e f d a g f d a b f d b c f d b e f d b g f d b a f d c f e c f e c a f e c b f e c d f e d g f e d a f e d b f e g c f e g d f e g a f e g b f e a c f e a d f e a g f e a b f e b c f e b d f e b g f e b a f g c d f g c e f g c a f g c b f g d c f g d e f g d a f g d b f g e c f g e d f g e a f g e b f g a c f g a d f g a e f g a b f g b c f g b d f g b e f g b a f a c d f a c e f a c g f a c b f a d c f a d e f a d g f a d b f a e c f a e d f a e g f a e b f a g c f a g d f a g e f a g b f a b c f a b d f a b e f a b g f b c d f b c e f b c e f b c f a f b d c f b d e f b d g f b d a f b e c f b e d f b e g f b e a f b g c f b g d f b g e f b g a f b a c f b a d f b a e f b a g \]

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Starting from pitch b

\b c d e \b c d f \b c d \b c d g \b c d a \b c d \b c d \b c d \b c d e \b c d \b c d f \b c d g \b c d a \b c d \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \b c d a \b c d e \b c d f \b c d g \\
\b c d e \b c d f \b c d \b c d g \b c d a \b c d \b c d \b c d e \b c d \b c d f \b c d g \b c d a \b c d \b c d e \b c d f \b c d g \b c d a \b c d \b c d e \b c d f \b c d g \b c d a \b c d \b c d e \b c d f \b c d g \b c d a \b c d \b c d e \b c d f \b c d g \b c d a \b c d \b c d e \b c d f \b c d g \b c d a \b c d \b c d e \b c d f \b c d g \b c d a \b c d \b c d e \b c d f \b c d g \b c d a \b c d \b c d e \b c d f \b c d g \b c d a \b c d \b c d e \b c d f \b c d g \\

End of the MCP for Cmajor scale

A possible application of it would be a modal transformation of each possibility in a parallel way. It means just superimposing to every note of the MCP used all the needed sharps or flats that correspond to the selected mode. The transformation process also includes the absorption of the pattern in the tonal area of the selected mode.

A short example:

The third bar of the C MCP is filled with notes C D E A.
If we wish to do a modal parallel transformation of it using a C Lydian 3b 9b, it becomes C Db Eb A, because the alterations of C Lydian 3b9b in comparison to the C mother scale are Db Eb and F#.

Another example:
The same pattern, but using a E lydian 3b, becomes C# D# E A#, since E Lydian 3b is E F# G A# B C# D# and the notes of the original pattern are absorbed in the tonal center of E.
There are cases in which a pattern can have a plural development as the following example demonstrates: selecting the 3rd Messiaen's mode of limited transposition, we have two choices for the note E, that can become Eb or remain E. The pattern can then be interpreted as CDEAb or as CDEbAb.

In the next page follows the MCP for C major scale in musical notation compressed in one octave (Only the MCP starting from C is given: 120 permutations-bars)
Try to engrave the patterns from the other degrees of the scale in an apposite software, that I have elaborated already in alphabetic notation, as an exercise.
I say "as an exercise" because I think it is more practical to use alphabetic notation for the purpose of controlling the pitch sets in general.

Follows: a simple and practical computational music “secret” revealed!

As an example of my last statement I will introduce to you now, a “secret” technique, a very interesting way of transforming in any mode you want, all the 840 permutations of any MCP coming from a seven note scale in a few seconds, or any MCP. It also works for more permutations coming from larger selections of notes.
The operation is quite simple, and requires a few clicks. I refer as an example to the major scale MCP discussed until now.
After you have created the 840 permutations using a calculator, cut and copy them in notepad or another text editor of your choice, then select all of them or a part of them if you need, and through the function “find and replace”, substitute all the notes needed with the flatted or sharped notes belonging to your selected mode.
You will obtain the printing of all the patterns you selected in a new mode!
An example follows on the next page.

I select all the permutations from my MCP starting from A (120)
Say you want to transform the above in D superlocrian mode.
Click number 1 and 2: “I cut and copy them in a text editor “
Click 3: “Select all”
Click 4: “Find and replace” and write the notes you want replace in the “find” textbox and the flatted and/or sharped notes of the new mode (Bb Eb Ab Gb) in the “replace all” textbox. (this passage must be repeated for each note per time, DO NOT INPUT ALL THE NOTES AT ONCE).
Click 5: “Just press Enter “ and you have got 120 permutations starting from A in D superlocrian mode!

120 permutations starting from A in D superlocrian mode!

\( \text{\Ab c d Eb / Ab c d Gb / Ab c d Eb d / Ab c Eb f / Ab c Eb Gb / Ab c Eb Bb / Ab c f d / Ab c f Eb / Ab c f Gb / Ab c f Bb / Ab c Gb d / Ab c Gb Eb / Ab c Gb Bb / Ab c Bb d / Ab c Bb Eb / Ab c Bb Gb / Ab c Bb f / Ab Bb c / Ab Bb d / Ab Bb e / Ab Bb f / Ab Bb g / Ab Bb h / Ab Bb i} \)

The guitarist will practice the foregoing as chord voicings, applying each pattern to the all the strings sets, or as melody fragments to be further developed later on.

A pianistic application of the system!

A piano player can also use the system. He will just have to play in sequence the notes of each cell above on the piano to get the voicings. He can use two hands if necessary and add the D on bass or another D7 note at pleasure.

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The chromatic palette in K4!

Until now, I have introduced my system through a modal approach. But the real power of my computational technique, is when you use it in a pan modal chromatic thinking way (PMCT). The basic principle of this concept is that no notes are wrong in relation to the main function of the tonality and the effort the player (as a listener first, then player) has to make is to relate the pattern of the moment to a known modal background. This is the key to modernity according to my system.

That's why it is important to compute all the k3....to key 12 patterns possible in the chromatic system and practice them with a certain control.

In this first volume, I will start introducing the approach through all the permutations of K4 present in the chromatic system and compressed in one octave. The material, of my creation, in a pdf format will soon be download-able from my website while the website exists.

It is a huge amount of material! Of course, time permitting it would be auspicable that you develop by your own this material, using the procedures described in the beginning of this volume. This material is only a first step through the total control of the chromatic universe. In fact the material will be inserted in a software I wrote, to display and control all the possibilities that can be developed.

I am now going to explain how to use the material without software in this first volume, and in the next volume I will talk about the software and how to download it and use it.

Here we are going to learn how to use it in an «enhanced» tonal system the K4 chromatic permutations.

(If you don't have Internet, or a download access possibility of the material, you will find it in chapter 2 of this book, but for reasons of space, written in alphabetic notation.)

Let us start in a simple way: say you want improvise on a progression containing the 4 basic families of chords( Maj, min, Dominant, Half dim.).

You neither want to be limited by the basic known 28 modes, or even better you don't want to think about modes in a static way but you want to be able to interchange them while you build your melodic or harmonic statement. Here enters my system, because you can use any of the permutations printed in the tables and mix them as you like!

When you improvise or write a melody, a phrase or a sentence in general, one thing happens for sure; you play a note! That note must be one of the 12 in the chromatic system. That is why I printed all the permutations possible (990 *12), starting from each of the 12 notes in the chromatic scale.

Decide which note is the first, then select a pattern.

Then analyze it and understand to which mode that you know is closer.'

Ask to yourself what are the deviations from that mode if there are and decide if you want to accept them in your idea!This is really an important step.

If affirmative, proceed reading, if not repeat the process with the next pattern in the list until you are satisfied, then read on.

Next step is to apply the Met techniques described before.

I give you now an example of application of a pattern selected at random from the 990 in the table starting with note F on a random tonic : E.

1) Select a random number, Say number...596! The relative notes are F C G C#.

2) Analyze the set in relation to the 4 basic chord families in a selected key; for example E: Emajor (9b,6b, 3b,6): Emin (....make the analysis); E7(....) Emin75b(....).
3) Listen analytically to the alterations and relate the set to the closer mode you know, but also use pitch set tables to determine subset categories. For example selecting Emajor (9b, 6b, 3b, 6): the pattern can be a subset of F harmonic minor scale in which the Emin T (a chord having the function of a I maj7) is contained except for the a# of the chord. You can use online pitch set calculators to see at a glance sub or supersets of a pattern. Also the listening habit is very important to use to determine relationships to the pattern: in my personal listening habit I hear it, when related to Emaj7 as a really dissonant structure; then, if I really want to use it on E maj for the sake of the example I will handle it in the following way: there are 2 consonant notes in the structure C# (VI of E) and G(9#of EminT). In case I want to use the pattern in a kind of ingoing resolution. Since the last note of the structure is a C# I will call this an ingoing structure in this case and I will use it as it is in its original form.

4) Develop some phrases from it using basic MET as in the following example in which the pattern is adapted to a II V I.
MET on pattern 596

Basic pattern

Pattern development

transposition (non scolastic)

Complete Pattern to be used on II V I (F#min7 B7 Emajor7)

pt

Editing

More consonant note perm.

3minTransposition

Chr. app.

On E maj 7 only! Start out move in
MSRC CHART basics

A C dorian mode is nothing more than a C major scale with the flatted third and flatted seventh: 3b and 7b, 2 flats!
If we think in this way we could try to move 2 flats in all the places of the major scale obtaining new modes, and we could do that with sharps too and with a different number of them both. The purpose of the MSRC Chart is to show all of these possibilities. How to use them is left to the aesthetic judgment of the musician!

MSRC Chart for permutations from 3 to....5 notes patterns.

To develop a pattern from 3 to 5 notes in all the modes possible is the purpose of the following chart I invented. It contains all the possible combinations of alterations one could apply to a pattern. Doing it on each pattern one wants to study is a great exercise. The procedure of applying the chart to a pattern is similar to the one we have seen before using a selected mode. With the chart in front of your eyes you are not limited only to common known modes, A pattern can have altered a number of note that range from 1 to 12, In our case from 1 to 5. Of course a whole MCP can be used instead of a single pattern.

The chart is divided in alterations in K1, ……Kn and it can be used to alter the selected pattern from the selected MCP.

**Altering a formula in K3**

Example: formula 145 transposed in C it would be (CFG), in K2 it could become: C# F G# using the first K2 (#n#) that follows in the table. Using for ex. number 4 from K1 (nbn) the formula will become 1 4b 5, and so on.
As seen the letter n means that the note remains as it is: natural.

| K1 | n#n | #nn | nn# | nbn | bnn | nnb |
| K2 | #n# | n## | ##n | #nb | n#b | #bn | nb# | b#n | bnb | nbb | bbn |
| K3 | ### | ##b | #b# | b## | b#b | bb# |

**Altering a formula in K4**

Here I have synthesized the possibilities all together from K0 to K4)

```
####  ####b  ###n  ###b  ###bb  ###bn  ###n  ###nb  ###n#  b###  b#b  b#b#  b#bb  b#bn  bn#  bn#b  bn#n  bn#n#  bn#nb  bn#nn  bnn#  bnn#b  bnn#n  bnn#n#  bnn#nb  bnn#nn  bnnn#  bnnn#b  bnnn#n  bnnn#n#  bnnn#nb  bnnn#nn  bnnn#nnn
```

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Altering a formula in K5

Now numbers start to be big! We have 243 possibilities of altering the degrees of a pentatonic scale from K0 to K5.

There is another system we can use that is a little simpler, I will cover that in volume 2.
Chapter 2

All possible $11880$ K4 of the chromatic scale:

$C, C#, D, D# \cdots C, C#, F, F# \cdots C, C#, G, G# \cdots C, C#, A, A#$,

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Chapter 3

Atonal Improvisation Applications

In this chapter I will introduce an application of the foregoing described computational approach to contemporary atonal improvisation. The foregoing approach will help the improviser/researcher in absorbing deeply new materials that he is not used to hearing or practicing.

Let's see a way to apply on guitar atonal concepts like 12-tone rows, pitch set classes, trichords, symmetric transformations, expansions and many other contemporary concepts for the purpose of improvisation and composition.

I will start explaining a method to gain control on the guitar of all the possible rows in 12-tone style and suggests one of the possible styles of improvisation achievable within the perimeter of this technique.

The number of the possible rows of one octave is 479001600. Just to give an idea of the vastity of this material, I printed for you all the first hexachords (H1) of all the possible series in C; to obtain the complete series, use the relative hexachordal complement.

The list of all the possible hexachords from C is on my website.

How to control the above-mentioned list together with the complementary hexachords on guitar through my computational approach is the aim of this chapter!

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Some basic math about the 12-tone system

a) 12-tone rows thought through a strata building concept: Trichord-Hexachord-Complementary Hexachord-12-Tone Row. The complete list of all hexachordal sets in C (that is printed in the end of this volume) is in the order of 55440, (those hexachordal sets are formed by the permutations in K2 of all the 55 possible mother trichords in C); they form, together with their hexachordal complementary sets, all the possible 12-tone rows starting with C.

b) The 55 mother trichords

As known, there are only twelve trichords in prime form! The prime forms are a synthesis of the possible expansions of the trichords. They are very informative when used in music analysis. For practical purposes (composition or computation), I prefer to relate to the 55 actual trichords that are possible to build from a given tonic. Let us consider C as the tonic of all the possible trichords including their permutations; we then have the following 55 trichords:

\[
\begin{align*}
{c,c#,d} & \quad {c,c#,d#} & \quad {c,c#,e} & \quad {c,c#,f} & \quad {c,c#,f#} & \quad {c,c#,g} & \quad {c,c#,a} & \quad {c,c#,a#} \\
{c,c#,b} & \quad {c,d,d#} & \quad {c,d,e} & \quad {c,d,f} & \quad {c,d,f#} & \quad {c,d,g} & \quad {c,d,a} & \quad {c,d,a#} & \quad {c,d,b} & \quad {c,d#,e} \\
{c,d#,f} & \quad {c,d#,f#} & \quad {c,d#,g} & \quad {c,d#,a} & \quad {c,d#,a#} & \quad {c,d#,b} & \quad {c,e,f} & \quad {c,e,f#} & \quad {c,e,g} & \quad {c,e,g#} \\
{c,e,a} & \quad {c,e,a#} & \quad {c,e,b} & \quad {c,f,f#} & \quad {c,f,g} & \quad {c,f,g#} & \quad {c,f,a} & \quad {c,f,a#} & \quad {c,f,b} & \quad {c,f#,g} & \quad {c,f#,g#} & \quad {c,f#,a} \\
{c,f#,a#} & \quad {c,f#,b} & \quad {c,g,g#} & \quad {c,g,a} & \quad {c,g,a#} & \quad {c,g,b} & \quad {c,g#,a} & \quad {c,g#,a#} & \quad {c,g#,b} & \quad {c,a,a#} & \quad {c,a,b} & \quad {c,a#,b}
\end{align*}
\]

I call them mother trichords because they can be the building stones of all the possible 12-tone rows. Let us say that the first hexachord (H1) that constitutes the first part of a 12-tone row is one of the combinations of the 55 mother trichords (in C) 1+2, 1+3, 1+4,......1+55 with the possible transpositions of the second trichord. The second hexachord of the aggregate (H2) can give us 6! permutations. Doing the math, according to my calculations, the number of all the 12-tone series starting from C will be 39916800. The following few lines are common sense math instructions to calculate the relationship of a 12-tone row with trichords, hexachords, the 55 mother trichords, and to calculate the possible number of trichords starting from a tonic, hexachords with a fixed starting pitch set class, all the 12-tone rows in C, and more.

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Divide a tone row in 4 parts of 3 trichords each --> A B C D
Let us take as an example the first trichord in C from the 55 possible trichords: 012.
We will have 504 hexachords possible that start with A= c, c#, d.
To get the full 12-tone series,
we need to add the complementary hexachord to each of the possible 504 just obtained.
Each complementary set is made up of 6 notes that can be permuted giving
720 forms (3+3----C+D)
504*720 = 362880 is the number of all the possible 12-tone series starting with the trichord cc#d!
So we will have 362880 series starting with cc#d in one octave.
To obtain all the 12-tone series from C we multiply all the possible hexachords 55440, * 720,
this gives us the total number of all the 12-tone rows in C :39916800,
in fact, multiplying this number by 12 gives all the possible series in the chromatic system
479001600
Also 479001600 (the total number of the possible 12-tone rows divided by 12 gives us all the possible rows from each tonic of the chromatic scale
479001600:12=39916800

Immediate composition and performance using a row
A row can be used in several ways for improvisation purposes: we could follow strict 12-tone rules,
we could improvise on segments of it, or it could be used for giving us the tonics of a chordal progression or other. All of these approaches will be treated in the following volumes. The purpose of this chapter is to learn a way to visualize and control these atonal concepts on the guitar. Generally when we create a phrase from a scale, a mode, or other, we select a subset of its pitches or sometimes the whole set. Some of them can be repeated, we can use approach tones, augmentation and diminution, expansions, nota di volta, octave dispersion or other embellishment techniques to develop the basic set. The same can be done with a row! The only difference is that the succession of the pitches in a row is fixed. Or not?
A brief introduction about the segmentation of a possible row

We will now learn how to select, memorize and use portions (segmentations) of the row or the row in its integrity. Let us take this row as an example: F Ab E F# A D C Eb C# G Bb B
Without entering into the classical discussion about how the above row is constructed and the principles underlying its construction, we can segment this row in several ways for the purpose of using it in improvisation. We could use the first 3, 4,5,6,7,8,9,10,11, or all the 12 notes in the row. Or think of the row as built from 3+3+3 trichords or 4+4+4 tetrachords or 3+4+3+2 and so on. What are the possible combinations? They are simple or mixed, for example: 3+3+3+3 is simple, 3+4+3+2 is mixed.
The method to obtain all the sets of a pattern is exemplified in my preceding volume *DnA DiatonismoNeomodalismoArmonia*, now out of print.
Many alternative methods can be used to choose a segmentation for a row like in the following example:

<table>
<thead>
<tr>
<th>Magic Square of 12 of order 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>
**Segmentation**

To write down a complete list of possible segmentations is possible but not necessary! Anyhow, here is the list obtained using the Tartaglia triangle:
We will start using segmentations composed by the same number of 3, 4, or 6 notes in this first part, just to start!

\[3+3+3//4+4+4//6+6\]

A 12-tones row can always be decomposed as above. If we compress a row in an octave, we will have the pure row, without octave displacements. OCTAVE DISPLACEMENTS ARE ONLY A MELODIC TECHNIQUE, NOT A NECESSITY FOR A ROW!

Looking at rows in this way, they become more comfortable than thinking of 479001600 different entities.

**Choosing the 3+3+3+3 segmentation**

Choosing 3+3+3+3 means to choose trichords as generators of a 12-tone row

**How to build trichords-derived 12-tone rows**

We can build tone rows combining trichords from the 55 above described, using transposition (T)! But to have a 12-tone row, it is necessary to transpose at least 3 of the 4 trichords. Combining them in k4 with the proper transposition will give us all possible 12 tone rows in C.

For example combining 012+012 will give us only 7 possible hexachords, starting from C, plus their complements; it means 7 – 12 tone rows from C.

Now pay attention to the following discussion:

In improvisation, we are able to permutate with freedom the elements of a row so it will be possible to synthesize all the seven possible rows in C obtained from 012 in only one: the Chromatic Scale Tone Row; it means: 012 starting from each note of the Cdim7 chord. We will call this Synthesized 12-TONE ROW of Type 1 (SRT1).

George Russel, in his remarkable *Lydian Chromatic Concept*, wrote about the different impression a traveler could have navigating the Mississippi river from a steamer than visiting it from a rocket ship, an allusion of the different details that one perspective can give instead of another. The vision of the synthesized row is like the one that a traveler could get traveling on a space ship while the seven rows built from 012 x 4(trichords) are like a vision the one could get navigating between the major cities on the river.

The advantage of learning these 55 trichords is that they are, on the guitar, shapes, and then, being shapes, the transposition, the control and the relative improvisation will be easier than learning each of the many possible rows one by one.

**The process of segmenting a tone row**

(An example of reducing 12-tone a row to a k4 of the 55 mother trichords)

Row:

\[D# \ B \ A \ D \ C\# \ C \ F\# \ E \ G \ F \ A \ G\#
\]

Chosen segmentation:

3+3+3+3

Trichords

- D# B A D C# C F# E G F A G#

write your own analysis here.

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Now, in improvisation, if we want to use a row like the one above in its own integrity, the only thing we can do is changing the rhythms of each pitch or use some melodic techniques not changing the order of the notes of the row. But that would not be an IMPROVISATION in all senses, it would be rather called variation.

In composing a row for the purpose of improvisation, we will instead, use only ordered trichords and then improvise with all their permutations, as will be shown in later chapters.

**SUMMARY**

The steps to 12 tone improvisation are:

1.1.1) Master the 55 M T
1.1.2) Learn how to combine them to obtain interesting rows
1.1.3) Learn expansion techniques to develop them
1.1.4) Practice them melodically and harmonically
1.1.5) Study a formal language for improvising and composing with them
Chapter 4

How to learn the 55 shapes on guitar

As usual, there are more than one way! I will present here two of the most important. One of them is to study the 12 basic trichords together with their inversions (described later). A second way is to learn the shapes on the guitar of the actual 55 trichords that I think is the most useful approach on the guitar to improvise with derived series.

Method 1

A) Visualize the basic shapes on guitar of the 12 trichords melodically and harmonically. Use my software «Voicings» to have all the possible visualizations on the guitar of all the patterns you want!

B) Improvise on each trichord with melodic embellishments and expansions.

C) Improvise on the sets selected from the derived series.

If you do not own my software 

Voicings

, the following is a logic list of the possible visualizations of the trichords that are playable in 4 frets. (We will start with four frets visualizations because they are easy technically speaking on guitar). The possible groupings of frets should all be investigated later on, following the system explained in my now out of print book DNA. If you do not have the book, you will find a page with all possible adjacent groupings of frets on the guitar in the appendix. You should also experiment with non-adjacent groupings!

TRICORD 1 (C, C#, D)

We will start studying this trichord on single strings. Consider as an option the possibility of using open strings if they are present in the trichord, as add open notes.

6 combinations 108 permutations (then the relative diagrams will follow)

A good way of memorizing this material is to think about the string on which the pattern starts! So we will think basically six sets of possible groupings because the strings are 6. Then we will develop the trichord in an ordered way, studying it in groupings of 4 frets.

These groupings can be I, II, III, IV-II, IV, V, IX, X, XI, XII

We could select for example the following set of adjacent frets VIII, IX, X, XI.

4 FRETS LOGIC

3 (notes per string), (2+1, 1+2), 1+1+1 are also the possible factorial divisions of trichords. While 3 notes per string permutations do not change the visual configuration of the pattern, it does when the trichord is displaced on different string sets, in this case we will have to consider all the permutations and the 4 frets logic.

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DEVELOPMENT of trichord 1

In case of 3 notes per string we have the following six sets on the whole fretboard.

3 notes x string

(1 combination on six different strings).

An easy system to continue the study in 4 frets logic, is to select only 3 groups of 4 frets to apply the selected material: P1, P5, P9 as follows.
Case 2+1 notes per string

IN 3 POSITIONS OF 4 FRETS (P1,P5,P9)
5 basic combinations
Position 1: 3 patterns possible!

An example of a few bar single line phrase using the above material exclusively 3n x S and 2+1:

Position 5: 3 patterns possible!
An example that combines 2+1 in P1 and P5:

Before moving on to studying P8 I want to give an example of how to use the foregoing material in an hexachordal row improvisation.

**All the hexachordal rows in C derived from 012+012**

An ordered hexachordal row built just with 012+012 could be

CC#D  EF#G

or

CC#D  F#GG#

some others are possible of course, but to build all of them is quite easy, it is only necessary to select all the pitch sets transpositions, postponing them after the 012 in T0 (C). Then we will have to eliminate the rows that have pitches in common with the first one.

We will obtain 7 possible hexachordal rows in C eliminating the underlined that follow:

CC#D
C#DD#
DD#E
D#EF
EFF#
FF#G
F#GG#
GG#A
G#AA#
AA#B
A#BC
BCC#

The 7 possible combinations of 012+012 as we could see them traveling by a boat will be:
As an example, follows a transcribed phrase from a solo I recorded using hexachord number 4 just in P1 and P5 exclusively!

Analysis:

Bar 1
Beat 1: P5, 012 (C)
Beat 2: P1,012 (F#), with G doubled
Beat 3: P5, 012 (C) with Bb as ghost approach tone
Beat 4: chromatic scale with connecting function to the last trichord

Bar 2: Beat 1: P5, 012 (F#) after the first note that is the last one of the preceding chromatic scale
Remember 1+2 = 2+1 in the use of the material that we are targeting!
In 1+1+1 we will also get harmonic forms from the trichord!
Improvisation on the whole hexachord

After we have practiced for some time our 012 in C in the 3 basic position let us proceed to add a second trichord to form a complete hexachordal series. We choose from the complete list the first hexacord! We notice that the second trichord that forms it, is still number 1 from the 55 mother trichords but transposed in d#.

We must study it in the 3 positions as we have done for the first one.

The next step is to improvise mixing both of them obtaining in this way an improvisation on the whole hexachord. In the list, there are other instances of the first hexachord because of the permutations. When improvising we should consider only the prime form of the hexachords and using the patterns in 4 frets logic we will obtain all the possible permutations. In the opposite way, we will reduce a 12-tone row (in a permutation form) to an ordered one before proceeding to segmentation as described until now.

The final step is to find the complementary hexachord and, after the segmentation in two trichords, and the visualization in 4 fret logic, start the improvisation on the whole 12-tone row!

A transcription of one of my improvisations using the above material:

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An example selecting a random aggregate: patterns coming from the trichord derived from H1. 6-5 and its complementary hexachord H2

C C# F# A G# G / D D# E F A# B

1) All the 24 permutations of the trichords-derived between themselves without changing the internal order of each trichord:
2) All the internal permutations of each trichord
2) All the internal permutations of each hexachordal

These are some basic examples of concepts to obtain patterns from an aggregate row, the same process should be done for all the rows the artist will select as material for improvisation or composition, together with the relative matrix as in the next pages.

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Phrases based on trichordal-derived 6-5+complement

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Another word about complementary hexachords

Improvising on an aggregate and keeping part of it, as it is, requires some additional thinking. Let us assume that we want to improvise on a hexachord and its complement. But what complement? The one in prime form or one of its permutations? 12-tone series are obviously built also using normal forms, but more often, they are built using permutations of the hexachords. A hexachord complement can have 720 forms (permutations.) We can choose between them to form an aggregate. The picture is: Hexachord 1+ one of the 720 complementary permutations of the complementary prime form or normal form.
**An interesting type of $H1$ are the so called All-Combinatorial-Hexachords**

The pattern study I propose now is built from trichordal-derived of All-Combinatorial-Hexachords and their Complements.

<table>
<thead>
<tr>
<th>All-Combinatorial-Hexachords</th>
<th>Complementary Hexachords</th>
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<tbody>
<tr>
<td>1 C  C#  D  D#  E  F</td>
<td>F#  G  G#  A  A#  B  T6</td>
</tr>
<tr>
<td>2 C  D  D#  E  F  G</td>
<td>F#  Ab  A  Bb  B  Db  T6</td>
</tr>
<tr>
<td>3 C  D  E  F  G  A</td>
<td>F#  Ab  Bb  B  Db  Eb  T6</td>
</tr>
<tr>
<td>4 C  C#  D  F#  G  Ab</td>
<td>Eb  E  F  A  Bb  B  T3.T9</td>
</tr>
<tr>
<td>5 C  C#  E  F  G#  A</td>
<td>D  Eb  F#  G  Bb  B  T2 T6 T10</td>
</tr>
<tr>
<td>6 C  D  E  F#  G#  A#</td>
<td>Db  Eb  F  G  A  B  Whole-Tone</td>
</tr>
</tbody>
</table>

I choose to start with a segmentation in trichords of the aggregates. Further theoretical explanations terminology and a methodical approach to this material applied to the guitar will follow.
Patterns based on Line 1 only permutating the internal order of each trichord but not changing their order in the aggregate.

I start combining all the permutations of the first trichord with all the permutations of the second trichord, obtaining all the permutations internal to the first hexachord h1, then I will use the rule of transposition that this particular hexachord offers, obtaining all possible internal combinations of the trichords in h2, and, finally I will combine all the internal permutations of h1 with each one of h2.

In the next pages there are all the basic possible trichordal derived internal permutations patterns coming from All Combinatorial Hexachord number 1.
(A brief analysis of the sheet above)
Patterns starting with h1 and all the permutations go from bar 1 to bar 36 patterns with h2 goes from bar 37 to bar 72. Please remember that we are talking about internal permutations of each trichord without changing the sequential order of the trichords in the aggregate. We can do that later on. To obtain all the possible patterns of the aggregate without octave dispersion and without changing the sequence of the trichords derived, combine all the 1 to 36 permutations of h1 with all the permutations of h2 (37 to 72).
H1 Retrograde
We can now create patterns that uses $h_1 + h_2$ or the retrograde form of them, choosing from the preceding tables; this way we get used to all the possible basic patterns of $H_1$ and its complement $H_2$.

Combine as many patterns as possible and practice them on the guitar using the 4 fret logic.

Use also the others All-Combinatorial-Hexachords in the table above described.
A second step is to apply variational techniques to these patterns. Some examples follow.
Another interesting H1 (0,1,2,6,7,8)  C,C#,F#,D,G,Ab  
(Chords/Voicings)  

According to the segmentation we use we can have basic 2, 3, 4, 5 or 6 notes voicings on the guitar. I start presenting one way of deriving atonal harmonies in form of trichords derived. I just pick up another random Hexachord from the list in the end of this volume for the example. H1: C C# F# D G Ab  (ordering it ---> Forte Code 6-7 ). Notice that this particular permutation of Hexachord 6-7 is made by trichord 0,1,6 and its inversion(0,5,6) transposed at T2 (2 ,7, 8 ) 
The possible voicings of 3 notes coming from the preceding H1,in one octave without repetition, are 120. Experiment with fingerings and connecting with smooth harmonic movement the trichords-derived. 

Warning:  practice to your own risk !  
To apply on the guitar the 120 trichords, one should study all the voicings on every set of strings adjacent and not adjacent. What follows are all the voicings of the trichords of h1. Even if written in common music notation, you should consider each not as a pitch class. To find all the fingerings that are possible to play, one should apply each chord on all the possible sets of strings of the guitar, but notice that many of them are not possible to play and/or they require excessive finger stretching !

C C# F#/ | C C# D | C C# G | C C Ab | C F# C# | C F# D | C F# G | C F# Ab | C D C# | C D F# | C D G | C D Ab | C G C# | C G F# | C G D | C G Ab | C Ab C# | C Ab F# | C Ab D | C Ab G | C C F# | C C D | C C G | C C Ab | C F# C | C# F# D | C# F# G | C# F# Ab | C# D C | C# D F# | C# D G | C# D Ab | C# G C | C# G F# | C# G D | C# G Ab | C# Ab C | C# Ab F | C# Ab D | C# Ab G | F# C C# | F# C D | F# C G | F# C Ab | F# C C | F# C D | F# C G | F# C Ab | F# D C | F# D C# | F# D G | F# D Ab | F# G C | F# G C# | F# G D | F# G Ab | F# Ab C | F# Ab C# | F# Ab D | F# Ab G | D C C# | D C F# | D C G | D C Ab | D C C# | D C F# | D C G | D C Ab | D F# C | D F# C# | D F# G | D F# Ab | D G C | D G C# | D G F# | D G Ab | D Ab C | D Ab C# | D Ab F# | D Ab G | G C C# | G C F# | G C D | G C Ab | G C# C | G C# F# | G C# D | G C Ab | G F# C | G F# C# | G F# D | G F# Ab | G D C | G D C# | G D F# | G D Ab | G Ab C | G Ab C# | G Ab F# | G Ab D | G Ab G | H C C# | H C F# | H C D | H C Ab | H C# C | H C# F# | H C# D | H C Ab | H F# C | H F# C# | H F# D | H F# Ab | H G C | H G C# | H G F# | H G Ab | H G# C | H G# F# | H G# Ab | H H C# | H H F# | H H G | I C | I C C# | I C F# | I C D | I C Ab | I C# C | I C# F# | I C# D | I C Ab | I D F# | I D G | I G C | I G C# | I G F# | I G Ab | I G# C | I G# F# | I G# Ab | I H C# | I H F# | I H G | I I C | I I C C# | I I C F# | I I C D | I I C Ab | I I C# C | I I C# F# | I I C# D | I I C Ab | I I D F# | I I D G | I I G C | I I G C# | I I G F# | I I G Ab | I I G# C | I I G# F# | I I G# Ab | I I H C# | I I H F# | I I H G | I I I C | I I I C C# | I I I C F# | I I I C D | I I I C Ab | I I I C# C | I I I C# F# | I I I C# D | I I I C Ab | I I I D F# | I I I D G | I I I G C | I I I G C# | I I I G F# | I I I G Ab | I I I G# C | I I I G# F# | I I I G# Ab | I I I H C# | I I I H F# | I I I H G | I I I I C | I I I I C C# | I I I I C F# | I I I I C D | I I I I C Ab | I I I I C# C | I I I I C# F# | I I I I C# D | I I I I C Ab | I I I I D F# | I I I I D G | I I I I G C | I I I I G C# | I I I I G F# | I I I I G Ab | I I I I G# C | I I I I G# F# | I I I I G# Ab | I I I I H C# | I I I I H F# | I I I I H G |

Take care to play only the voicings that requires fingerings that your hand can handle. Do not overstretch your fingers it could damage your tendons!

In the guitar books «Harmonic Mechanism» written by George Van Eps are described all the possible string sets on the guitar. I suggest to check out those books.

I suggest to start composing tunes that can support the style of the material discussed until now, for the purpose of improvisation. Start simple, with just a few ideas taken for example from the chords above presented and some melodic forms of the Hexachord-generator. I used these two simple ideas in composing «I-V Considerations». Try to analyze it if possible. Can you explain the why of the title?

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Another interesting approach for improvising on this hexachord and its complement is to visualize its intervallistic structure on the guitar, focusing on the shapes that the 2 trichords derived from H1 forms.

In fact C C# F# can be moved in a translation movement on the same set of strings (5) (4) to D G Ab being the second trichord an inversion of the first one as already said.

One could think of an improvisation based on this movement on the fretboard. The following example show this concept and some development of the idea through basic permutation operations, doublings, angularity, interval anchor and the last pattern presents a vertical translation on the fretboard in seventh position. Start experimenting on your own.

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The list of the 55400 hexachords starting from note C (78 PAGES)

Permutations included!

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End of the hexachordal complete list starting from note C.
End of Volume 1