

Improving Improvisational Skills Using Impro-Visor (Improvisation Advisor)

TI:ME 2012 Presentation

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Please Ask Questions

- Questions are fine during the presentation.
- During this talk, I will demonstrate certain aspects live on Impro-Visor. Not everything is represented in these slides.

A second Impro-Visor talk

- A second, more hands-on, Impro-Visor talk is offered Thursday afternoon at 1:30 in Clements (ST2 track).
- “Bring your own laptop” aspect is optional.

Motivation

- Having taught jazz improvisation as a “side line” for a few years, I desired a notation tool that would:
 - Help students produce **clean homework** of written-out solos.
 - Provide **assistance** of some kind to the students.
 - Act as a **repository or notebook** for improvisational ideas.
- **Impro-Visor** is the result.

Free Software

- Impro-Visor is free, open-source, software, funded as an academic research project by NSF, The Mellon Foundation, and The Baker Foundation.
- It runs on Windows, Mac, and Linux.
- Version 4.12 had over 19,000 downloads.
- 6800+ users in user group, 45 countries.
- Developers are mostly college students.

Contributors to Software & Design

- Prof. Robert Keller
- Prof. Belinda Thom
- Stephen Jones
- Aaron Wolin
- David Morrison
- Martin Hunt
- Sayuri Soejima
- Stephen Lee
- Emma Carlson
- Xanda Schofield
- August Toman-Yih
- Steven Gomez
- Jim Herold
- Brandy McMenemy
- John Goodman
- Jon Gillick
- Kevin Tang
- Chad Waters
- Nicolas Froment
- Ryan Wiegard
- Zack Merritt
- Amos Byon

Conventional Wisdom

for learning to improvise

- Choose a solo from some jazz master.
- Transcribe the solo from audio and memorize it.
- Repeat, until you “know how to improvise”.

Problems with Conventional Wisdom

- Difficult enough to be a show-stopper.
- The learner does not *own* the result.
- Learner could end up sounding like
(you are trying to be) a clone of the famous master.

Alternative Approach

for learning to improvise

- Pick a tune you like, or be assigned one.
- **Construct your own solo** over the chord progression of the tune. (Note: You own it.)
- Play your solo. Improvise as needed to make it sound good.
- Repeat, with different tunes.

Impro-Visor

- Impro-Visor = “Improvisation Advisor”
- Designed with the Alternative Approach in mind.
- Can also be used with the Conventional Approach.
- Provides customized automated accompaniment and other features.

Getting Advice on Preliminaries

If the student doesn't know the notes in a chord or scale, **advice** can be consulted.

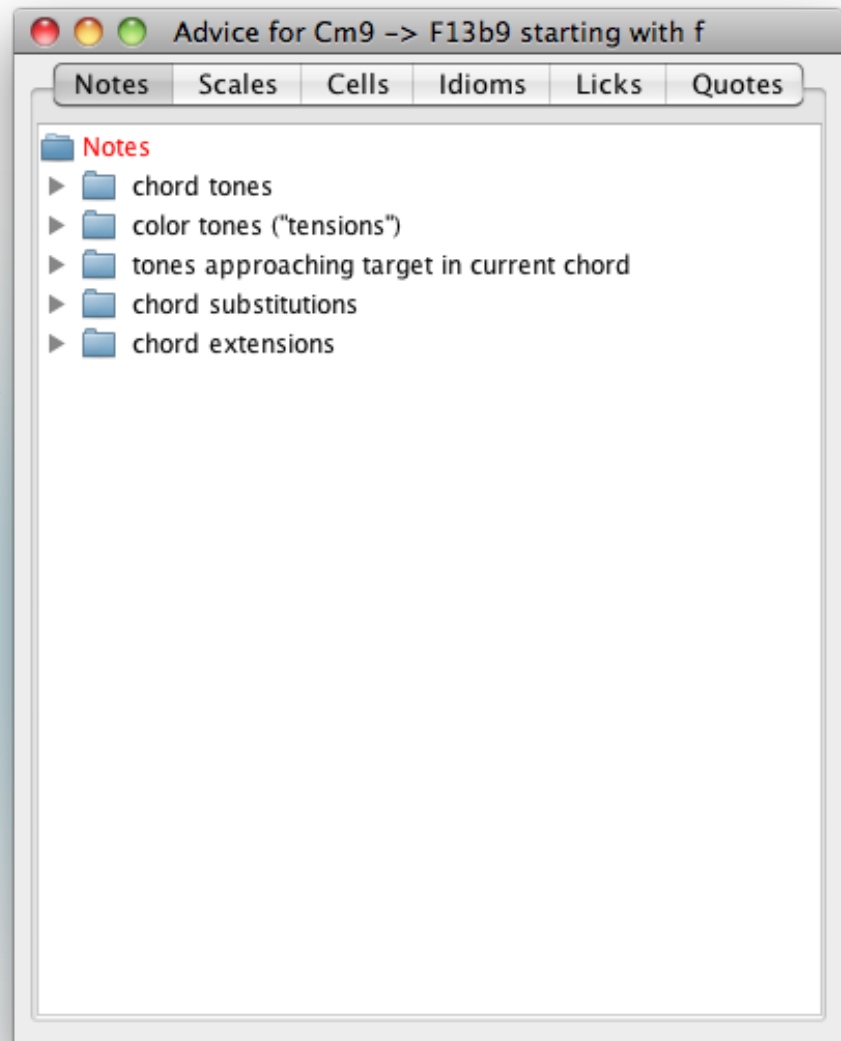
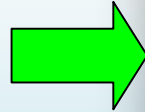
The screenshot displays the Impro-Visor software interface for a 12-Bar Blues. The window title is "Impro-Visor: 12-Bar Blues". The menu bar includes File, Edit, Transpose, View, Play, Utilities, Roadmap, Window, My grammar, Preferences, and Help. The toolbar contains various icons for file operations, playback, and editing. The main interface shows a musical score for a 12-Bar Blues in 4/4 time, with a style of "swing". The score is divided into three lines of music. The first line contains measures 1-4 with chords F13_, Bb13, Bo7, F13_, Cm9, and F13b9. The second line contains measures 5-8 with chords Bb13, Bo7, F13_, and D7#5#9. The third line contains measures 9-12 with chords Gm9, C13b9, F13_, D7#5#9, Gm9, and C13b9. A vertical red line is positioned at the start of measure 4, and a vertical green line is positioned at the start of measure 8. The interface also includes a "Textual Entry" field, a "Clear" button, and various playback controls like "Loop", "Mute", "Tempo", and "Bars".

Advice Menu

On leadsheet



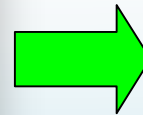
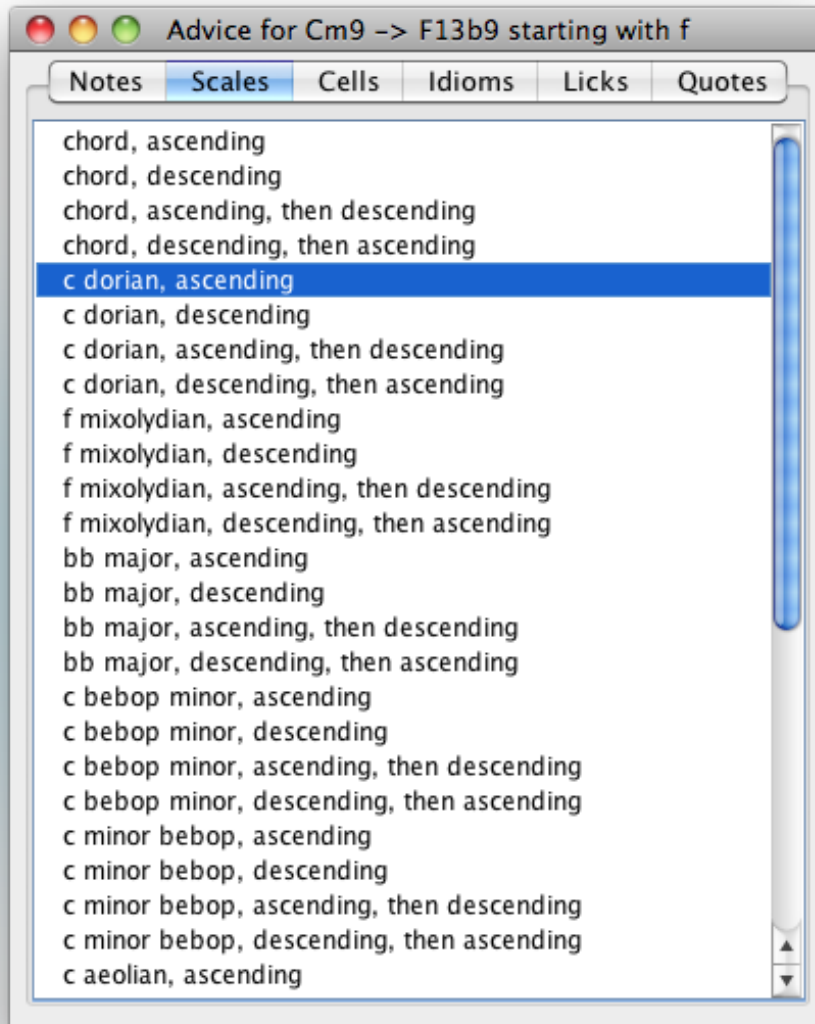
A musical staff showing two chords: Cm9 and F13b9. The Cm9 chord is highlighted with a red vertical line and a blue box, with the number '4' above it. The F13b9 chord is shown to the right. The notes for Cm9 are C4, Eb4, G4, Bb4, and C5. The notes for F13b9 are F4, Ab4, C5, Eb5, F5, Ab5, and C6.



A software window titled "Advice for Cm9 -> F13b9 starting with f". The window has a menu bar with "Notes", "Scales", "Cells", "Idioms", "Licks", and "Quotes". The "Notes" menu is open, showing a list of folders:

- Notes
 - chord tones
 - color tones ("tensions")
 - tones approaching target in current chord
 - chord substitutions
 - chord extensions

Scale Advice Example



Note Coloration

Optional **color coding** for visual feedback:

black: chord tone

green: “color” tone (aka “tension”)

blue: chromatic approach tone to one of the above

red: none of the above (error or “outside”?)

Coloration can be toggled on or off.

Example suggested by Mark Levine, *The Jazz Theory Book*:

The image shows a musical staff in 4/4 time with three measures. Above the staff are the chord symbols: Dm7b5, G7b9, and Cm6/9. The notes are color-coded according to the legend: black for chord tones, green for 'color' tones (tensions), blue for chromatic approach tones, and red for 'outside' notes. Measure 1 (Dm7b5) contains notes D4 (black), F4 (black), Ab4 (red), and C5 (black). Measure 2 (G7b9) contains notes G4 (black), Bb4 (black), D5 (black), F5 (black), Ab4 (black), and C5 (black). Measure 3 (Cm6/9) contains notes C4 (black), Eb4 (black), F4 (black), G4 (black), Ab4 (black), Bb4 (black), C5 (black), and D5 (black). A blue note (F#4) is shown as a chromatic approach to G4 in the second measure. A green note (Ab4) is shown as a 'color' tone in the third measure. A red note (Ab4) is shown as an 'outside' note in the first measure.

Composing Solos

- Writing one's own solo is the original intended use of Impro-Visor.
- We are not the first to suggest this. See for example, David Baker's article: "When An Improvisor Thinks Like a Composer", Jazz Player Magazine, 1997.
- For the tune under study, compose a solo of one or two choruses, or maybe just a fragment.
- Ideally, be able to play the solo. Don't make it too complex.

Students' Use of Coloration

Students (should) use coloration to spot mistakes in their own solo compositions.



Students' Use of Coloration

Students (should) use coloration to spot mistakes in their own solo compositions.



Impro-Visor Provides Help

- **Coloration**, as discussed
- **Harmonic** point-and-click entry:
 - Notes **gravitate** to chord and color tones.
- Harmonic **rectification** to clean up melodies.
- **Aural** feedback (note + chord)
- **Advice** (suggestions for scales, licks, etc.)

Example Class Assignment

- Assign the class the task of writing a solo for the tune of the week.
- They **email** their submissions (which are text files) to the instructor.
- The instructor creates a **composite** of the submissions.
- Each submission is one **chorus** of the composite.

Reviewing Class Assignment

- In class, the **composite** is played for the students.
- They **watch** it on an LCD display while listening.
- They **critique** each others work.
- The instructor also provides critique.
- Examples:
 - <http://www.cs.hmc.edu/~keller/jazz/improvisor/classroom/MomentsNoticeSolos.htm>
 - <http://www.cs.hmc.edu/~keller/jazz/improvisor/classroom>

Does this really work?

- My subjective experience, compared to not doing it, says **definitely yes**.
- Not really possible to do a **controlled** experiment; every player is different + different players each semester.

Why It *Should* Work

The compositional approach increases **intellectual engagement** with the material and principles of melody construction, over and above:

- Pure transcription, which does not force thinking about construction.
- Pure rote practice, which can be more visceral than intellectual.

Context Clarification

- Impro-Visor is for use in the “woodshed”.
- We are not suggesting that live performance must be other than emotional and physical.

Advice for Writer's Block

- In addition to chords and scales, Impro-Visor provides a library of:
 - Cells
 - Idioms
 - Licks
 - Quotes
- The user can use these in solos.
- Users can add new ones that sound good to them.

Licks, etc. Advice

Advice for Cm9 -> F13b9 starting with f

Notes Scales Cells Idioms **Licks** Quotes

/\ [Cm7 -> F7] major 2-5 (f8 g8 f8 eb8 d8 c4)
/\ [Cm7 -> F7] parker (f8 g16 f16 e8 eb4 c8 bb-8 g-8)
/\ [Cm7 -> F7] 2-5 Parker (f8 g16 f16 e8 eb4 c8 bb-8 g-8)
∨ [Cm7 -> F7b9] 2-5 (f8 eb4 c8 gb-4 ab-8 a-8)
∨ [Cm7 -> F7] parker (f8 e8 eb8 g-8 d4 g4)
∨\ [Cm7 -> F7] parker (f8 eb4 e4 g4 e8)
∨\ [Cm7 -> F7] parker (f-8 e-8 eb-8 f-8 f8 eb8 d8 c8)
∨\ [Cm7 -> F7] parker (f8 e8 eb8 c8 bb-8 g-8 d8 c8)
∨\ [Cm7 -> F7] 2-5 Parker (f8 eb8 c8 g-8 d4 f8 c8)
∨\ [Cm7 -> F7] 2-5 Parker (f8 e8 eb8 c8 bb-8 g-8 d8 c8)
∨\ [Cm7 -> F7] 2-5 Bill Evans (f+8 d+8 r8/3 bb8/3 b8/3 d
∨\ [Cm7 -> F7] 2-5 Bill Evans (f+8 e+8 f+8 d+8 c+8 bb8 a
/\ [Cm7 -> F7b9] 2-5 (f8 g4 c+8 gb8 ab8 eb8 a-8)
∨\ [Cm7 -> F7] 2-5 (f+8 e+8 eb+8 db+8 d+8 f8 g4)
\ [Cm7 -> F9] major 2-5 (f+8 eb+8 d+8 c+8 b8 a8 ab8 gb
∨\ [Cm7 -> F9] major 2-5 (f+8 eb+8 d+8 c+8 b8 c+8 eb+
∨\ [Cm7 -> F7] 2-5 (f8 eb8 d8 b-8 c8 eb8 g8 c+8 a8)
∨\ [Cm7 -> F7] major 2-5 (f8 bb-8 c8 f8 ab8 gb8 f8 eb8 f
∨\ [Cm7 -> F9] major 2-5 (f8 eb8 d8 c8 ab8 gb8 f8 eb8 f
/\ [Cm7 -> F7] major 2-5 (f8 g8 eb8 b-8 d8 eb8 gb8 d8
∨\ [Cm7 -> F7] major 2-5 (f8 bb-8 eb8 d8 a-8 c8 gb8 al
∨\ [Cm7 -> F7] major 2-5 (f8 bb-8 eb8 d8 c8 a-8 eb8 gl
∨\ [Cm7 -> F7] major 2-5 (f8 bb-8 d8 eb8 c8 eb8 gb8 al
/\ [Cm7 -> F7] major 2-5 (f8 gb8 eb8 b-8 d8 c8 gb8 al
/\ [Cm7 -> F7] major 2-5 (f8 g8 eb8 f8 d8 eb8 gb8 d8
/\ [Cm7 -> F7] major 2-5 (f8 g8 eb8 f8 d8 c8 gb8 d8 f
/\ [Cm7 -> F7] major 2-5 (f8 g8 eb8 f8 d8 c8 db8 a-8
∨\ [Cm7 -> F7] 2-5 Coltrane (f+8 d+8 eb+8 f+8 g+8 et
∨\ [Cm7 -> F7] major 2-5 (f+8 eb+8 c+8 bb8 c+8 b8
∨\ [Cm7 -> F7] 2-5 Coltrane (f+16 e+16 f+16 g+16 a+16



Cm9 **F13b9**

Text-Based Information

- The user or teacher can add, delete, modify musical information.
- Everything is in plain text.
- The next page shows what a chord definition entails.

Chord Definition in Vocabulary

(chord

(name CM69)

(pronounce C major six nine)

(key c)

(family major)

(spell c8 e8 g8 a8 d8)

(color b8 f#8)

(priority d8 e8 a8 g8 c8)

(voicings

(left-hand-A (type closed)(notes e8 g8 a8 d+8)(extension))

(left-hand-B (type closed)(notes g8 d+8 e+8 a+8)(extension))

(quartal (type open)(notes e8 a8 d+8 g+8)(extension))

(shout-A (type shout)(notes e8 g8 a8 d+8)(extension d++8 g++8 d+++8))

(shout-B (type shout)(notes g8 d+8 e+8 a+8)(extension d++8 g++8 d+++8))

)

(extensions CM69#11)

(scales

(C major)

(C lydian)

(C bebop major)

(C major pentatonic)

(G major pentatonic)

(D major pentatonic)

(C major blues)

)

(substitute CM7 CM9 CM69#11)

)

Chord Voicing Editor

Chord Voicing Utility

Chord Root: C Voicing Range: c- to a
Bass is Root
Bass: C Bass Range: c-- to b--

Build Table
Piano Keyboard

Voicing: (e- g- a- d) Play
Extension: Insert
Add New Delete

Sequence:
Remove Add Play

Chord Search: CM69

Chord	Name	Type	Voicing	Extension
CM6	open-A	open	(e a c+ g+)	
CM6	open-B	open	(g e+ a+ C++)	
CM6	drop-2-A	open	(a-- e- g- c)	
CM6	drop-2-B	open	(c- g- a- e)	
CM6	drop-2-C	open	(e- a- c g)	
CM6	drop-2-D	open	(g- c e a)	
C6	(uses CM6)			
CM69	generated	closed	(e- a- d g)	
CM69	left-hand-A	closed	(e g a d+)	
CM69	left-hand-B	closed	(g d+ e+ a+)	
CM69	quartal	open	(e a d+ g+)	
CM69	shout-A	shout	(e g a d+)	(d++ g++ d+++)

Keyboard

Options Mode Transpose Playback Window

CM69

Bass note indicated in blue.
Ctrl-click to change bass note, Shift-click to change bass range.
Ctrl-shift-click to add an extension.

Play Chord

- Impro-Visor will generate a voicing if none of the ones specified is within range.
- Playback includes a voice-leading algorithm.

Lick Generation

- Impro-Visor will **generate** new melodic material on its own.
- Some of this material can be informed by solos learned from other players.
- There is a **grammatical** basis underlying our technology.

Examples of Generated Licks

9 **Gm9** 10 **C13b9**

This musical staff shows two measures of music. The first measure is labeled **Gm9** and contains a lick starting on the 9th fret. The second measure is labeled **C13b9** and contains a lick starting on the 10th fret. Green dots highlight specific notes in both licks.

9 **Gm9** 10 **C13b9**

This musical staff shows two measures of music. The first measure is labeled **Gm9** and contains a lick starting on the 9th fret with two triplet markings. The second measure is labeled **C13b9** and contains a lick starting on the 10th fret. Green dots highlight notes in both licks, and blue dots highlight specific notes in the second measure.

9 **Gm9** 10 **C13b9**

This musical staff shows two measures of music. The first measure is labeled **Gm9** and contains a lick starting on the 9th fret. The second measure is labeled **C13b9** and contains a lick starting on the 10th fret. Green dots highlight notes in both licks.

Grammar Illustration

- Let B denote one beat of music.
- We could fill a beat with a variety of rhythms:



- A grammar represents all of these **choices**:

$$B \rightarrow X_4$$

$$B \rightarrow X_8 X_8$$

$$B \rightarrow X_8 X_{16} X_{16}$$

Here X_4 , X_8 , X_{16} are understood terminal symbols, while B is a non-terminal to be expanded.

Probabilistic Grammar Illustration

- Assign a **probability** to the various choices.
- Probabilities will then dictate a prevalent style.



- A probabilistic grammar represents a distribution of these choices:

$B \rightarrow X_4$	$p = 0.3$	common
$B \rightarrow X_8 X_8$	$p = 0.6$	frequent
$B \rightarrow X_8 X_{16} X_{16}$	$p = 0.1$	rare

Grammars Can Exhibit Hierarchy and Recurrence



- Instead of

$B \rightarrow X_4$	$p = 0.3$	common
$B \rightarrow X_8 X_8$	$p = 0.6$	frequent
$B \rightarrow X_8 X_{16} X_{16}$	$p = 0.1$	rare

- Use

$B \rightarrow X_4$	$p = 0.3$	common
$B \rightarrow C C$	$p = 0.7$	frequent
$C \rightarrow X_8$	$p = 0.8$	very frequent
$C \rightarrow X_{16} X_{16}$	$p = 0.2$	rare

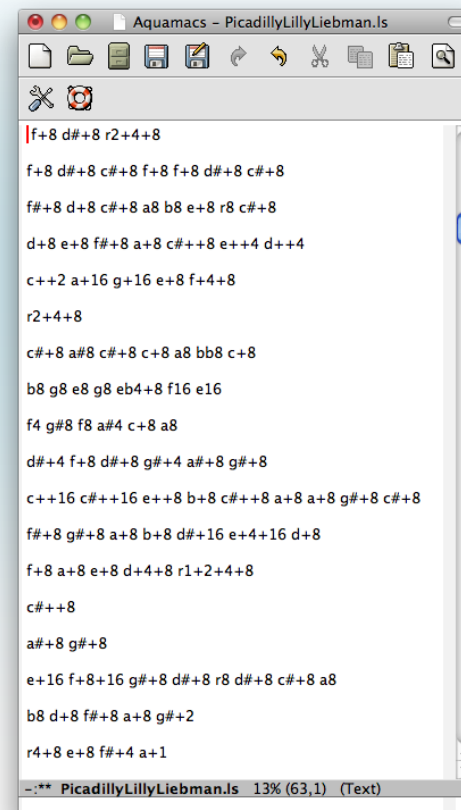
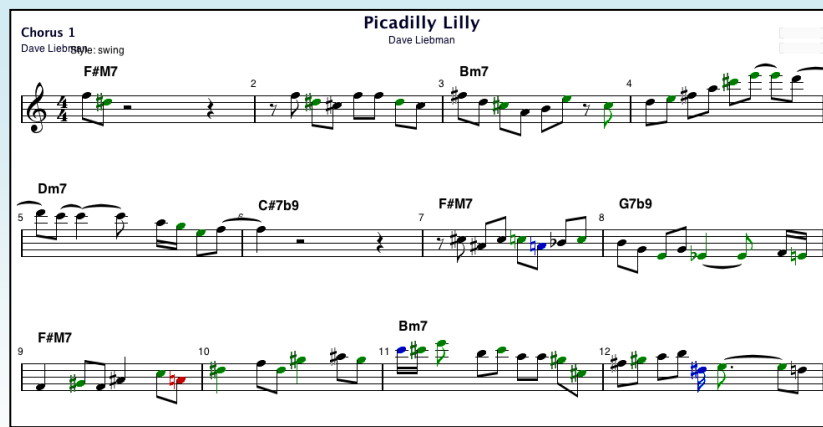
- Generates

				
$p = 0.3$	$p = 0.448$	$p = 0.112$	$p = 0.112$	$p = 0.028$

Grammar Learning

Impro-Visor's grammar learning facility enables grammars to be learned from a corpus of one or more solo transcriptions.

Transcription of Dave Liebman's Solo on Picadilly Lilly:



```
f+8 d#+8 r2+4+8
f+8 d#+8 c#+8 f+8 f+8 d#+8 c#+8
f#+8 d+8 c#+8 a8 b8 e+8 r8 c#+8
d+8 e+8 f#+8 a+8 c#+8 e+++4 d+++4
c++2 a+16 g+16 e+8 f+4+8
r2+4+8
c#+8 a#8 c#+8 c+8 a8 bb8 c+8
b8 g8 e8 g8 eb4+8 f16 e16
f4 g#8 f8 a#4 c+8 a8
d#+4 f+8 d#+8 g#+4 a#+8 g#+8
c++16 c#+16 e++8 b+8 c#+8 a+8 a+8 g#+8 c#+8
f#+8 g#+8 a+8 b+8 d#+16 e+4+16 d+8
f+8 a+8 e+8 d+4+8 r1+2+4+8
c#++8
a#+8 g#+8
e+16 f+8+16 g#+8 d#+8 r8 d#+8 c#+8 a8
b8 d+8 f#+8 a+8 g#+2
r4+8 e+8 f#+4+1
```

Learned Grammars



My grammar	Preferences	H
Backup		
Bare		
BillEvans		
CharlieParker		
CliffordBrown		
ColemanHawkins-Ballads		
DaveLiebman		
DexterGordon		
DizzyGillespie		
FreddieHubbard		
JimmyHeath		
JohnJohnson		
JohnColtrane		
KeithJarrrett		
LeeMorgan		
MilesDavis		
My		
MyFours		
Outside		
RedGarland		
TomHarrell-Waltzes		
TomHarrell		
Zoo		

Play-Along Exercises

- These can be done in class or individually.
- Exercises with accompaniment.
- Solo with the program accompanying.
- Trade with the program.
- Comp the program as it generates a melody.
- Play bass or drums while the program plays other parts.
- Sight-reading practice.

Example: Customized Exercises

- Exercises are more fun when played with accompaniment.
- It is helpful to be able to adjust tempo, etc.
- It takes only a few minutes to construct these sorts of exercises using Impro-Visor.
- The next page shows a diminished scale exercise, suggested by Eric Alexander.

Diminished Scale Exercise

Descending Half-Whole Diminished Scale over Dominants

suggested by Eric Alexander

Style: swing

The image shows a musical score for a descending half-whole diminished scale exercise over dominants. The score is written in 4/4 time and consists of three staves of music. The first staff contains measures 1 and 2, with a C7 chord above measure 1. The second staff contains measures 3 and 4, with an F7 chord above measure 3. The third staff contains measures 5 and 6, with a Bb7 chord above measure 5. The fourth staff contains measures 7 and 8, with an Eb7 chord above measure 7. The fifth staff contains measures 9 and 10, with an Ab7 chord above measure 9. The sixth staff contains measures 11 and 12, with a Db7 chord above measure 11. The notes in the scale are: C7: C, B, Bb, A, G, F, E, D; F7: F, E, Eb, D, C, B, Bb, A; Bb7: Bb, Ab, G, F, E, D, C, B; Eb7: Eb, Db, C, B, Ab, G, F, E; Ab7: Ab, G, F, E, D, C, B, Bb; Db7: Db, C, B, Ab, G, F, E, Eb. The notes are marked with green dots.

etc. over all 12 dominants

Fixed Trading with Impro-Visor

- Starting with an existing solo, delete every other group of four bars.
- Play the result and have the students trade fours with the fixed solo.
- Adjust tempo to suit the tune and abilities (30 to 300 beat-per-minute available).

Soloing with Impro-Visor

- Delete the melody entirely.
- Solo with the generated background.

Dynamic Trading with Impro-Visor

- Instead of fixed trading, Impro-Visor generates fours dynamically.
- This requires a special grammar and settings.
- Impro-Visor will trade until memory runs out. (It remembers everything generated).

Comping with Impro-Visor

- Impro-Visor generates the solo.
- Impro-Visor plays bass and drums.
- User comps the solo on chord instrument.
- Or, user plays bass or drums, letting Impro-Visor comp.

Road Maps

- Road maps are Impro-Visor's newest feature.
- Tunes are automatically analyzed into keys and "bricks".
- Bricks are idiomatic chord progressions, such as cadences and turnarounds.
- These help the beginner to intermediate player understand the tune.
- The idea of bricks is from Conrad Cork in the U.K.

Analyzing a Tune using Bricks

Blue Bossa
Kenny Dorham
1963

Style: swing

1 Cm69 2 3 Fm7 4

5 Dm7b5 6 G7alt 7 Cm69 8

9 Ebm7 10 Ab7 11 DbM7 12

13 Dm7b5 14 G7alt 15 Cm69 16 Dm7b5 G7alt

Join Names
(yellow tags)

Input
Chords

Inferred
Key

Brick
Name

Blue Bossa

C Minor			
On Off Minor IV			
Cm69		Fm7	
			Backslider
C Minor			
Sad Cadence			
Dm7b5	G7alt	Cm69	
			Cherokee
Db Major			
Straight Cadence			
Ebm7	Ab7	DbM7	
			Downwinder
C Minor			C Minor
Sad Cadence			Sad Launcher
Dm7b5	G7alt	Cm69	Dm7b5 G7alt
			Homer

Playback Styles

- Background is automatically generated from style specification.
- Styles can switch with sections.
- Users can tweak existing styles, or create new ones.
- Style learning (from MIDI + chord sheet) is available.

Style Switching Example

Chorus 1
Bob Keller

The Night Has a Thousand Eyes
Jerry Brainin and Buddy Bernier

Night Has a Thousand Eyes (film)
1948

Style: latin-pedal-bass-1

GM9

Am7/G

GM9

Am7/G

Style: swing

Dm9

G13b9

CM9

F13#11

Bm9

Bbo7

Am9

D13b9

GM9

Style: latin-pedal-bass-1

GM9

Am7/G

Detailed description: The image shows a musical score for the song 'The Night Has a Thousand Eyes'. It is divided into four systems of music. The first system (measures 1-4) is in a 4/4 time signature and features a 'latin-pedal-bass-1' style. The second system (measures 5-8) continues with the same style. The third system (measures 9-16) switches to a 'swing' style. The fourth system (measures 17-20) returns to the 'latin-pedal-bass-1' style. Chord changes are indicated above the staff at various points: GM9, Am7/G, GM9, Am7/G, Dm9, G13b9, CM9, F13#11, Bm9, Bbo7, Am9, D13b9, GM9, GM9, and Am7/G. Measure numbers 1 through 20 are marked along the staff.

Style Pattern Editor

Piano-Roll Pattern Editor: Column 1 of african.sty

Window

Open Bass Bar Editor Long vertical lines are beats. Bass, Chord, and Percussion sections are independent, not linked together.

Bass

Chord

Acoustic Bass Drum

Closed Hi-Hat

Open Hi-Hat

Mute Hi Conga

Open Hi Conga

Maracas

Crash Cymbal 1

Cabasa

Inter-Loop Delay

Pattern Last Played:

Loop Percussion

Play Saved Pattern

Bass

Chord

Percussion

From/To Style Editor

From Style Editor Column 1 1

To Style Editor Column 1 1

Resolutions

Tempo (Beats per Minute) 130

Visual (30-120 pixels per beat) 120

Time (1-120 tick marks per beat) 8

This pattern, from an African style was learned from a MIDI performance generated by Band-in-a-Box®.

For More Information

Please consult the Impro-Visor web site for more information: www.impro-visor.com

