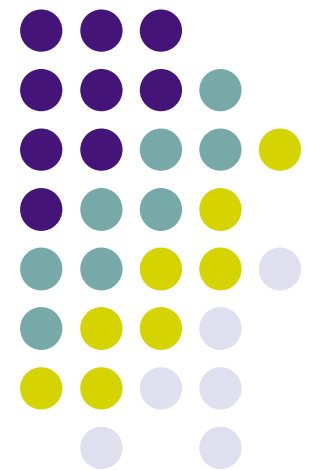


Improvisation Education Support Software

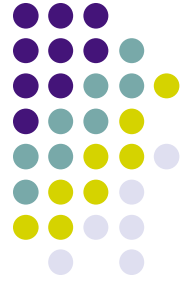
Towards a Personal Improvisation Companion

Robert M. Keller
Harvey Mudd College
Claremont, California, USA

Leeds International Jazz Conference
Leeds, England
March 25-26, 2010

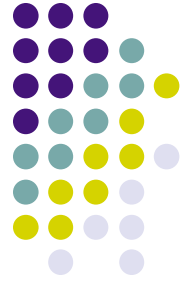


Acknowledgement: Contributors



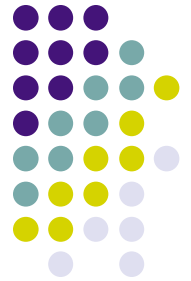
- Stephen Jones
- Aaron Wolin
- David Morrison
- Martin Hunt
- Emma Carlson
- Stephen Lee
- Sayuri Soejima
- Belinda Thom
- Jon Gillick
- Kevin Tang
- Steve Gomez
- Brandy McMenemy
- Jim Herold
- Chad Waters
- Nicolas Froment
- John Goodman

Acknowledgement: Support



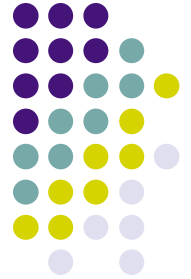
- The Mellon Foundation
- The National Science Foundation
- The Baker Fund
- Harvey Mudd College

Structural Aspects of this Talk



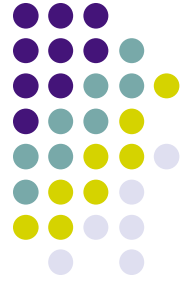
- I will identify some *future* possibilities *along with* current features,
- rather than waiting until the end.

Software Tool for Jazz



- Supports intellectualization, exploration
- Provides aural feedback
- Can act as a companion, e.g.
 - Play-along
 - Trading melodies
- Encourages thought about
 - Tune structure
 - Melodic ideas

Jazz is an Emotional *and* Intellectual Activity



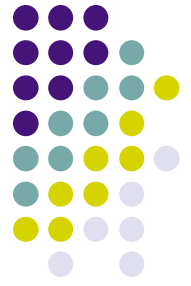
- We are artists on the stand.
 - There we want to emote, not think.
- But we are analysts in the shed.
 - Plan.
 - Analyse.
 - Experiment.
 - Exchange ideas.
 - Then push everything to the subconscious level.

Improvisation Support Tool:

Impro-Visor™

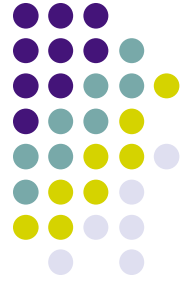


Background of Impro-Visor



- Began in mid-2005
- Improvisation Course Experience
 - Students compose solos as part of study and preparation
 - Desire legible and playable results
 - Advise the player, without a personal coach
- Personal Improvisation Experience
 - Work out lines
 - Save for later reference
 - Transcribe the work of others

Composition vs. Transcription



- Ownership of Results
- Pride of Ownership
- Enjoyment and Satisfaction



Impro-Visor

= “Improvisation Advisor”

- Composition support tool
- User ideally should do most of the work
 - Assistance provided on music theory
 - Chord spellings
 - Scale choices
 - Archival aspect
 - Licks, Idioms, Cells, Quotes
- Detailed suggestions provided to user, *if needed*

Impro-Visor: 12-Bar Blues

File Edit Transpose View Play Utilities Window Grammar: My Preferences Help

Generate Freeze B/W Simple No Beam Program Status
Click in notes, or type in textual entry field

Count Playback Location Looping Volume Tempo (Beats per Minute) Transpose Bars/Chorus Tracker Delay Parallax
0:00 0:16 Loop 2 Mute 180.0 0 12 0 0

Textual Entry

Clear

Chorus 1

12-Bar Blues

Style: swing

F13

Bb13

Bo7

F13

Cm9

F13b9

Bb13

Bo7

F13

D7#5#9

Gm9

C13b9

F13

D7#5#9

Gm9

C13b9

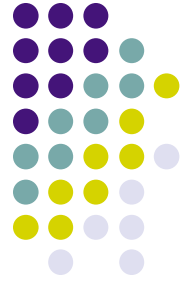


Note Entry Options

- Point & Click
- Textual: e8 g8 bb8 db+8 e+8+4+1
- MIDI keyboard (better developed in future)
- **Harmonic** Point & Click, or Sketch:
Notes gravitate to
chord/color tones

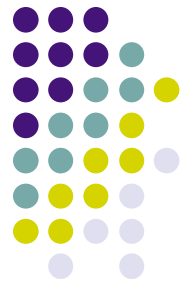
C13b9 C13b9 Gm9 C13b9

instead of



Future Work on Note Entry

- Optionally indicate functions alongside the notes (e.g. #9).
- Make the sketch aspect smoother and adjustable as a spline.



Micro-Advice on Theory: Chord & Approach Tones

Advice for C13b9 -> F13 (unspecified starting note)

Notes Scales Cells Idioms Licks Quotes

- Notes
 - chord tones
 - color tones ("tensions")
 - general
 - d#
 - f#
 - common with next chord (F13) or its extensions
 - tones approaching target in current chord
 - chord tones approaching target in next chord (F13)
 - approaching f
 - approaching a
 - approaching c
 - db
 - approaching eb
 - approaching d
 - non-chord tones approaching target in next chord (F13)
 - chord extensions

C13b9 F13

10 11

Scale Choice Advice



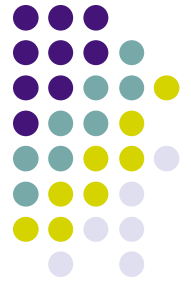
Advice for C13b9 -> F13 starting with db

Notes Scales Cells Idioms Licks Quotes

- chord, ascending
- chord, descending
- chord, ascending, then descending
- chord, descending, then ascending
- db diminished, ascending
- db diminished, descending
- db diminished, ascending, then descending
- db diminished, descending, then ascending
- f harmonic minor, ascending
- f harmonic minor, descending
- f harmonic minor, ascending, then descending
- f harmonic minor, descending, then ascending

C13b9 F13 D7

10 11



Melodic Cells

Contour profiles

Advice for C13b9 -> F13 starting with db

Notes Scales **Cells** Idioms Licks Quotes

- /\ [C7#5#9] dominant-altered (db-8 e-8 gb-8 eb-8)
- /\ [C7#5#9] dominant-altered (db-8 e-8 ab-8 gb-8)
- \ [C7#5#9] dominant-altered (db8 bb-8 gb-8 ab-8)
- \ [C7#5#9] dominant-altered (db8 c8 bb-8 eb8)**
- \ [C7#5#9] dominant-altered (db8 c8 ab-8 bb-8)
- /\ [C7alt] dominant-altered (db8 eb8 e8 ab4+8 gb8 e8)
- \ \ [C7alt] dominant-altered (db8 bb-8 c8 e8 gb8 bb8 a)
- / \ \ [C7alt] dominant-altered (db8 e8 ab8 gb8 c+8 bb8
- / \ \ [C7alt] dominant-altered (db8 e8 bb-8 c8 db8 e8 al
- / \ \ [C7alt] dominant-altered quartal (db8 gb8 bb8 e8 al
- \ \ [C7] chromatic (db8 bb-8 c8 bb-8 ab-8 a-8 bb-8 b

C13b9 F13 D7

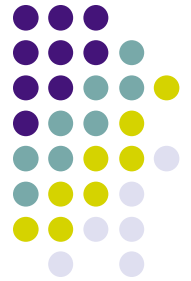
10 11



Note Coloration Option

- Black: Chord Tones
- Green: Color Tones (“Tensions”)
- Blue: Approach Tone
- Red: Outside





Future:
Automate
search for
licks based
on attributes

Advice for F13 -> D7#5#9 (unspecified starting note)

Notes Scales Cells Idioms **Licks** Quotes

/\ [F13 -> D7#5#9] I7-VI7alt (gb-8 r4 c8 eb8 d8 bb-8 f-8)
/\ [F13 -> D7#5#9] I7-VI7alt (b-8 eb4 eb8 c8 bb-8 gb-4)
\ [F13 -> D7#5#9] I7-VI7alt (r4 b-8 f-8 c-8 d-8 gb-8 bb-8)
\ [F13 -> D7#5#9] I7-VI7alt (gb8 gb8 f8 eb8 d8 c8 ab-8 bb-8)
\ [F13 -> D7#5#9] I7-VI7alt (gb-4 eb-8 c-8 f-8 bb-8 d8 f8)
\ [F13 -> D7#5#9] I7-VI7alt (r4 eb4 d8 bb-8 c8 f8)
\ [F13 -> D7#5#9] I7-VI7alt (c8 a-4 eb-8 c-8 f-8 bb-4)
\ [F13 -> D7#5#9] I7-VI7alt (a-4+8 r8 ab-8/3 c8/3 d8/3 f4)
/\ [F13 -> D7#5#9] I7-VI7alt (eb-8 gb-8 c-4 f-8 bb-8 d8 f8)
\ [F13 -> D7#5#9] I7-VI7alt (a8 g8 f8/3 c8/3 db8/3 c8 gb-

F13 D7#5#9 Gm9 C1

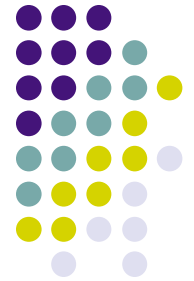
11 12



Lick Generator

- Addresses Need for Novelty and Robustness
- Arbitrary-Length Chord Progression

The diagram illustrates the Lick Generator process. It shows a sequence of four chords: **F13**, **D7#5#9**, **Gm9**, and **C13b9**. A **Generate** button with a lightbulb icon is shown below the chords. Below the button, a musical staff shows the generated lick, with notes colored to match the chord colors (red for F13, yellow for D7#5#9, green for Gm9, and blue for C13b9).



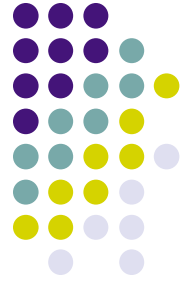
Saving Licks for Reference

Save Selection in Vocabulary

Name this:

Cell Idiom Lick Quote

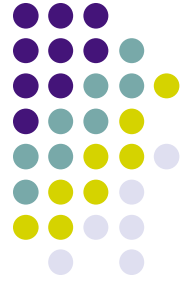
11 **F13** **D7#5#9** 12 **Gm9** **C13b9**



Future Advisory Work

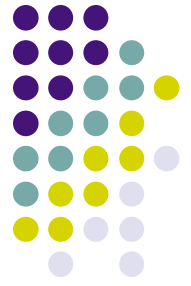
- Automatically derive and display:
 - Key maps
 - Lego road maps
 - Analytic hints
- Locate chord progressions within a corpus of tunes (subject to any transposition) such as “The Imaginary Book”

Grammatical Basis for Licks



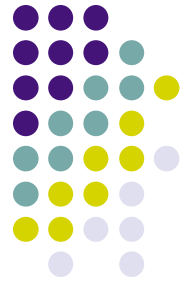
- Grammar generates melodic lines using probabilities.
- Grammar rules indicate how **melodic space** is to be filled.
- Rules can be tuned to generate simple or complex melodies.
- The note coloration **categories** play an important rule.

Grammar Learning Capability



- Impro-Visor can *learn* a grammar from a set of transcriptions.
- The grammar will generate lines containing figures similar to ones in the transcription, but still novel.
- The chord progression for generation need not be the same as in the transcriptions

Expandable Grammar Repertoire



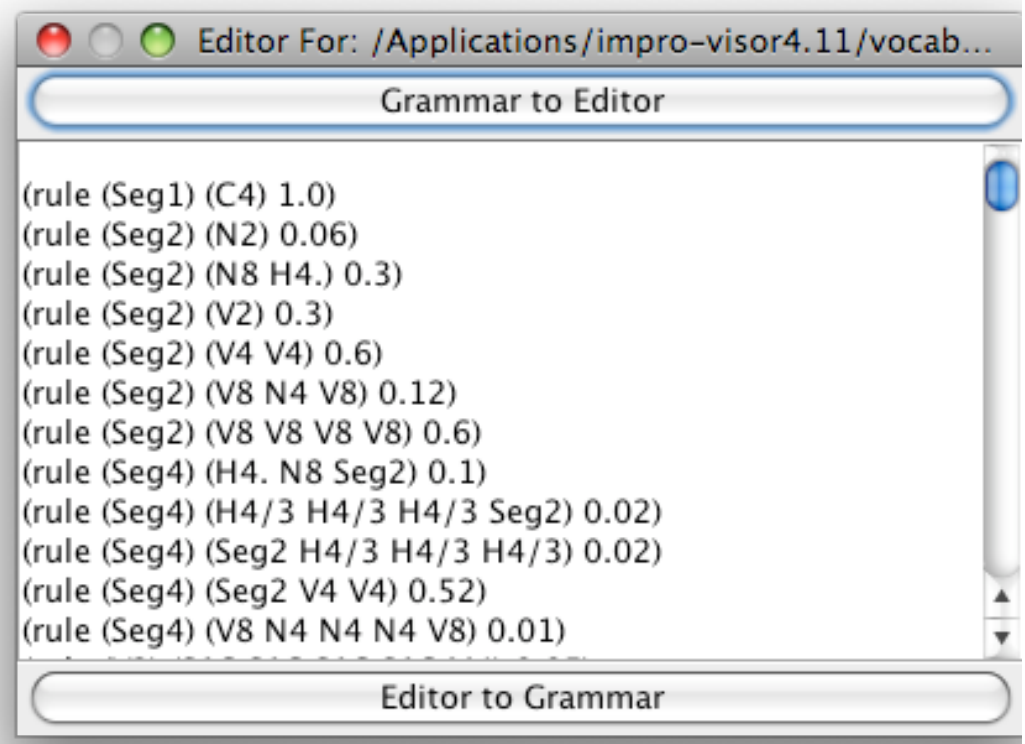
- Some preliminary grammars available:
 Hand-crafted, or
 Derived automatically
 from a few transcriptions.
- We need more transcribers.

Backup
Bare
BillEvans
CharlieParker
CliffordBrown
ColemanHawkins-Ballads
DizzyGillespie
FreddieHubbard
JimmyHeath
JohnColtrane
LeeMorgan
MilesDavis
My
MyFours
RedGarland
TomHarrell-Waltzes
TomHarrell
Zoo



Future Work on Grammars

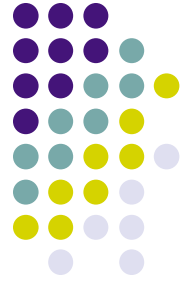
- Provide a more *user-friendly* interface for manipulating:
 - Editing and tuning
 - Mix-and-match rules
 - Automatically derive trading grammar from a given base grammar





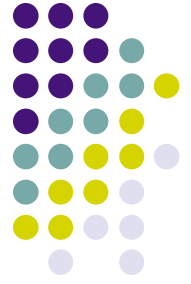
Multiple Purposes

- As Impro-Visor was improved based on further R&D, it developed a split personality:
 - Play-along tool
 - Composition tool
 - Ability to improvise on its own
 - Multiple styles and style extraction
 - Ability to learn aspects of soloist stylesthus forming the basis for an **improvisation companion.**



Real-Time Usage

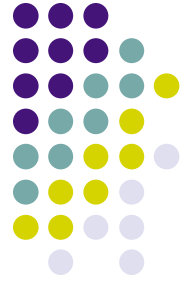
- Impro-Visor **auto-accompaniment** generated from
 - tune's chord progression, and
 - a style specification.
- Grammars can be used to specify **trading** 4's, 8's, etc.
- Can improvise in real-time, and **continue indefinitely**, in principle.



Future Work on Real-Time Aspects

- Smooth out MIDI sequence transitions.
- Port the tool to hand-held devices, e.g. iPod
- Better MIDI input.
- React to user **audio** input.
- Lick learning in real-time.

Current Classroom Usage



- Students are assigned the task of writing a chorus over the “tune of the week”.
- Students email their work to me.
- I composite the choruses and bring them to class.
- We listen to what they’ve written.
- They critique each others work.

Composite Tabbed Choruses



Adam Rob Michael Nick Stanley Angud Jen Christian Drew Esther

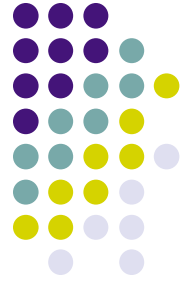
Rob

Style: swing
Em

Musical notation for Rob's composite tabbed chorus, consisting of two staves in 4/4 time. The key signature has one sharp (F#). The notation includes chord symbols (Em, Am, D7b9, G) and measure numbers (2, 3, 4, 5, 6, 7, 8). Green dots highlight specific notes, and blue dots highlight others. A blue slash is present in the final measure of the first staff.

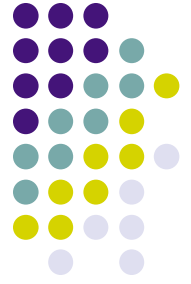
2 Am 3 Em 4 Am

5 Em 6 Am 7 D7b9 8 G



Textual Information Saving

- Lead sheets are saved in an openly-readable textual form I call “leadsheet notation”.
- Related notation is used to store:
 - Vocabulary
 - Scales, licks, etc.
 - Chords, voicings
 - Style specifications (swing, latin, rock, ...)
 - Grammar specifications



Download Free (Mac, PC, Linux)

- Visit
www.impro-visor.com

(include the dash).
- User group (about 5500 members):

<http://launch.groups.yahoo.com/group/impro-visor/>
- See also: Bob Keller's Jazz Page
www.cs.hmc.edu/~keller/jazz