The Complex of Non-Chromatic Scales

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WASP WALLENBERG AUTONOMOUS SYSTEMS AND SOFTWARE PROGRAM

KTH VETENSKAP OCH KONST

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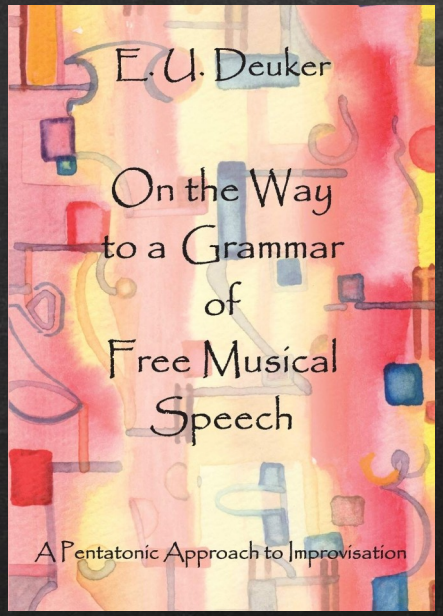


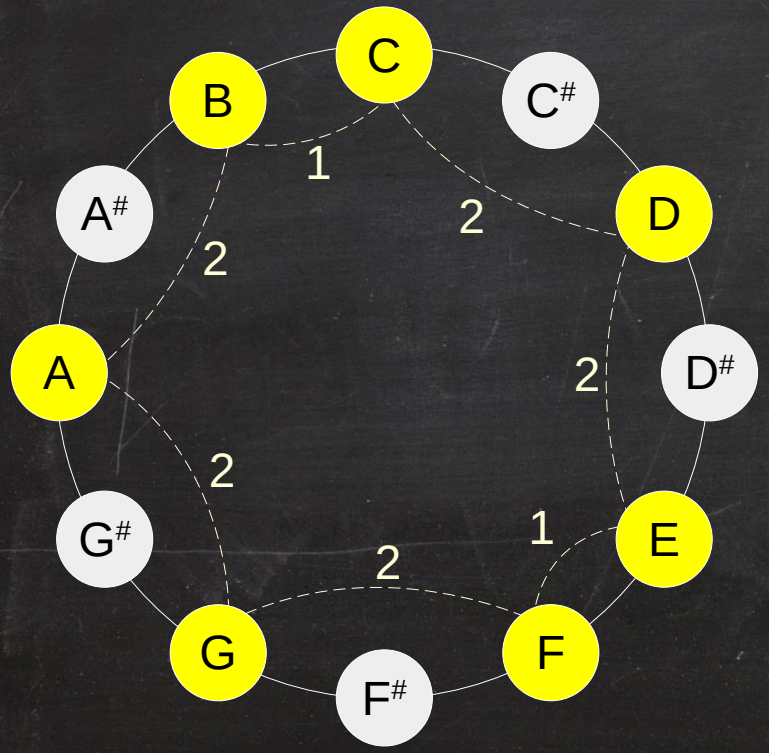
tonal musical language as a tool for free musical speech

intuitive starting points
for the spontaneous inventor of melodies (improviser)

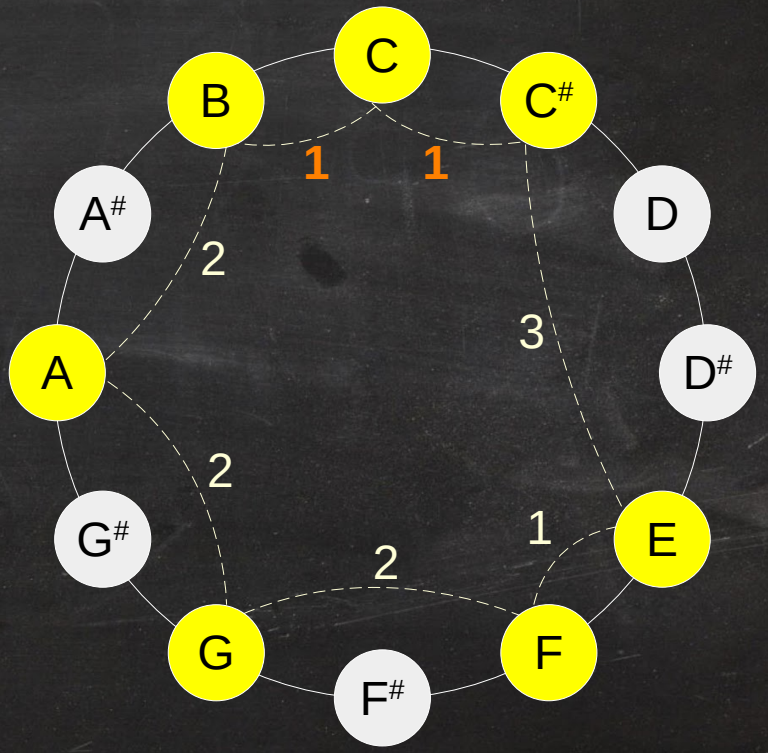
Language	**Painting**	**Improvising**
26 letters	3 primary colors (+ black / white)	7 types of non-chromatic scales
↓	↓	↓
nouns, verbs, adjectives, ...	secondary colors	partly chromatic scales
↓	↓	↓
sentences	paintings	melodies

non-chromatic scales

A scale is called **non-chromatic** if its interval sequence does not contain two consecutive semitones.



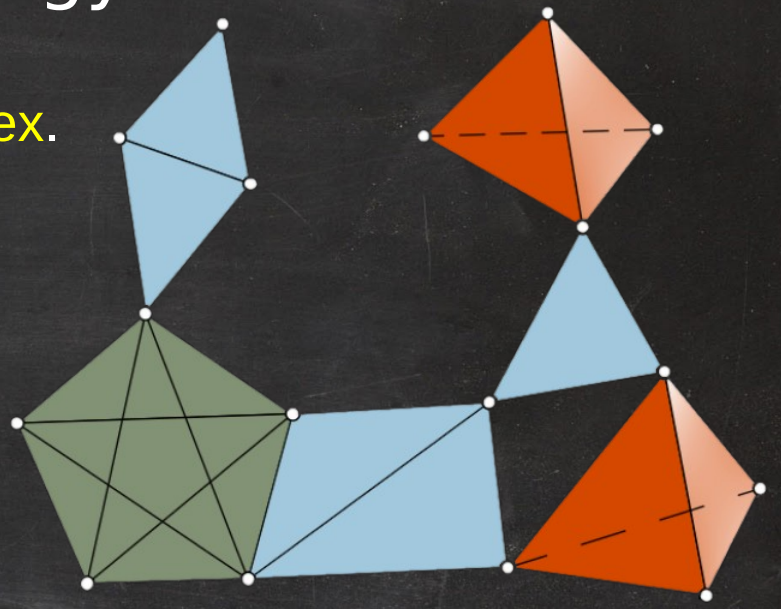
example



counterexample

algebraic topology

The non-chromatic scales form a simplicial complex.



f-vector:

#scales	1	12	66	208	399	456	282	72	3
#notes	0	1	2	3	4	5	6	7	8

57 facets:

#notes	name	#scales
8	diminished	3
7	melodic (classical) major	12
7	melodic minor	12
7	harmonic minor	12
7	harmonic major	12
6	whole-tone	2
6	half-tone / augmented	4

algebraic topology

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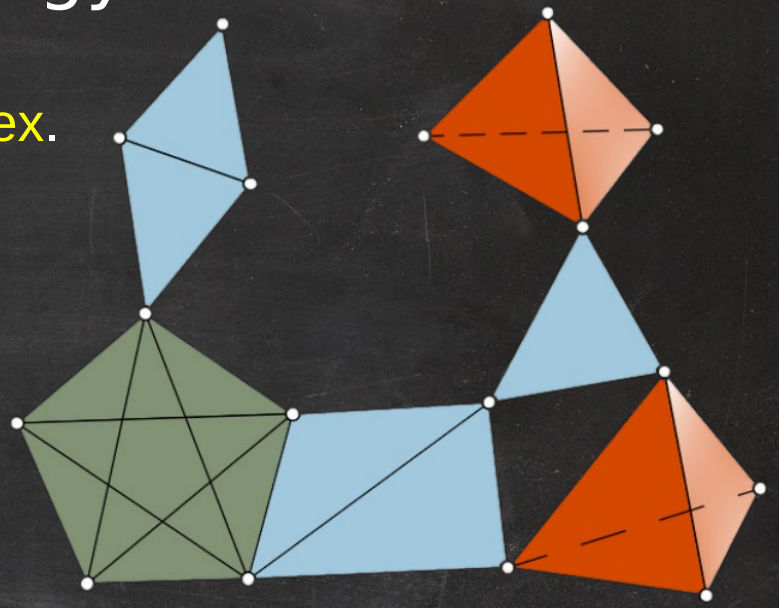

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Simplicial homology:

Reduction via collapses
= getting rid of scales bigger than hexatonics without changing the topology

$H_5 = \mathbf{Q}^3$ ⟷ 3 “holes” with remaining hexatonic scales on boundary

$H_n = \{0\}$ for $n \neq 5$

↑

extensions of 10 basic pentatonic forms