JASON WANGSADINATA

NETWORKS IN MUSIC

MOTIVATION

▸ Use well-known network analysis techniques to further understand the relations between musical notes.

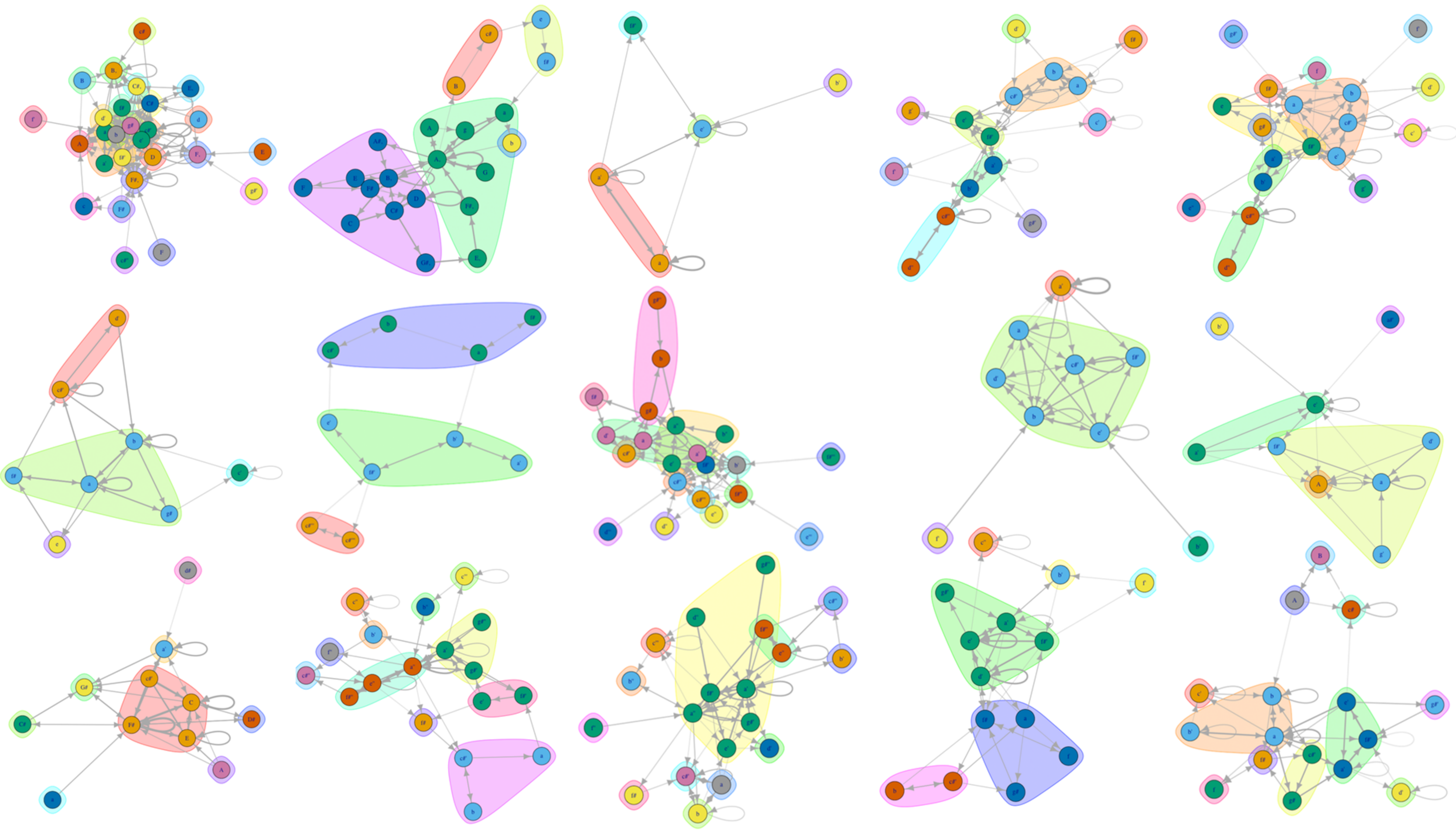▸ Visualize the similarity and differences of the range of the different musical instruments.

DATASET

▸ MIDI data of the song September by Earth, Wind and Fire.

▸ Contain time, length, track, channel, note, note name and velocity information.

▸ 15 different tracks, labelled by channel 0 - 14.

|	time	length	track	channel	note	notename	velocity
1	384	24	1	0	38	D	85
2	384	24	1	0	50	d	108
3	384	0	1	0	57	a	86
4	384	0	1	2	57	a	110
5	384	0	1	0	61	c#'	103
6	384	24	1	5	61	c#'	111
7	384	0	1	9	61	c#'	75
8	384	24	1	0	66	f#'	83
9	384	0	1	2	69	a'	115
10	384	24	1	7	69	a'	73
11	384	0	1	9	69	a'	66
12	408	24	1	2	57	a	79
13	408	0	1	2	69	a'	85
14	408	0	1	7	69	a'	57
15	432	24	1	0	38	D	62
16	432	24	1	0	50	d	77
17	432	0	1	0	57	a	73
18	432	0	1	2	57	a	95
19	432	0	1	0	61	c#'	71
20	432	0	1	5	61	c#'	90
21	432	24	1	0	66	f#'	72
22	432	0	1	2	69	a'	94
23	432	24	1	7	69	a'	70
24	432	0	1	9	69	a'	39

ANALYSIS

▸ Use `tuneR` package to obtain a data frame from MIDI data.

▸ The musical notes are vertices, and directed edges are constructed when a note moves to another note.

▸ Use Girvan-Newman Algorithm (`cluster_edge_betweenness`) which is an algorithm that form clusters based on the edges that are most likely between communities.

MAIN PIANO

▸ The graph was constructed from connecting two adjacent chords.

▸ Fm^7 ($F^\#$, A, $C^\#$, E) -> Bm^7 (B, D, $F^\#$, A) means there is a link from $F^\#$ -> B, $F^\#$ -> D, $F^\#$ -> $F^\#$, $F^\#$ -> A, and so on.

▸ The graph has 23 different communities, which is labelled in the different colors.

▸ The color of the nodes represent the membership.

MAIN MELODY

▸ Network reveals the melody movements.

▸ Thickness of edges represent frequency of the particular note movements.

▸ f#, d' f', g#' are used as a passing note.

▸ This network is also shows separation of the verse and chorus of the song.
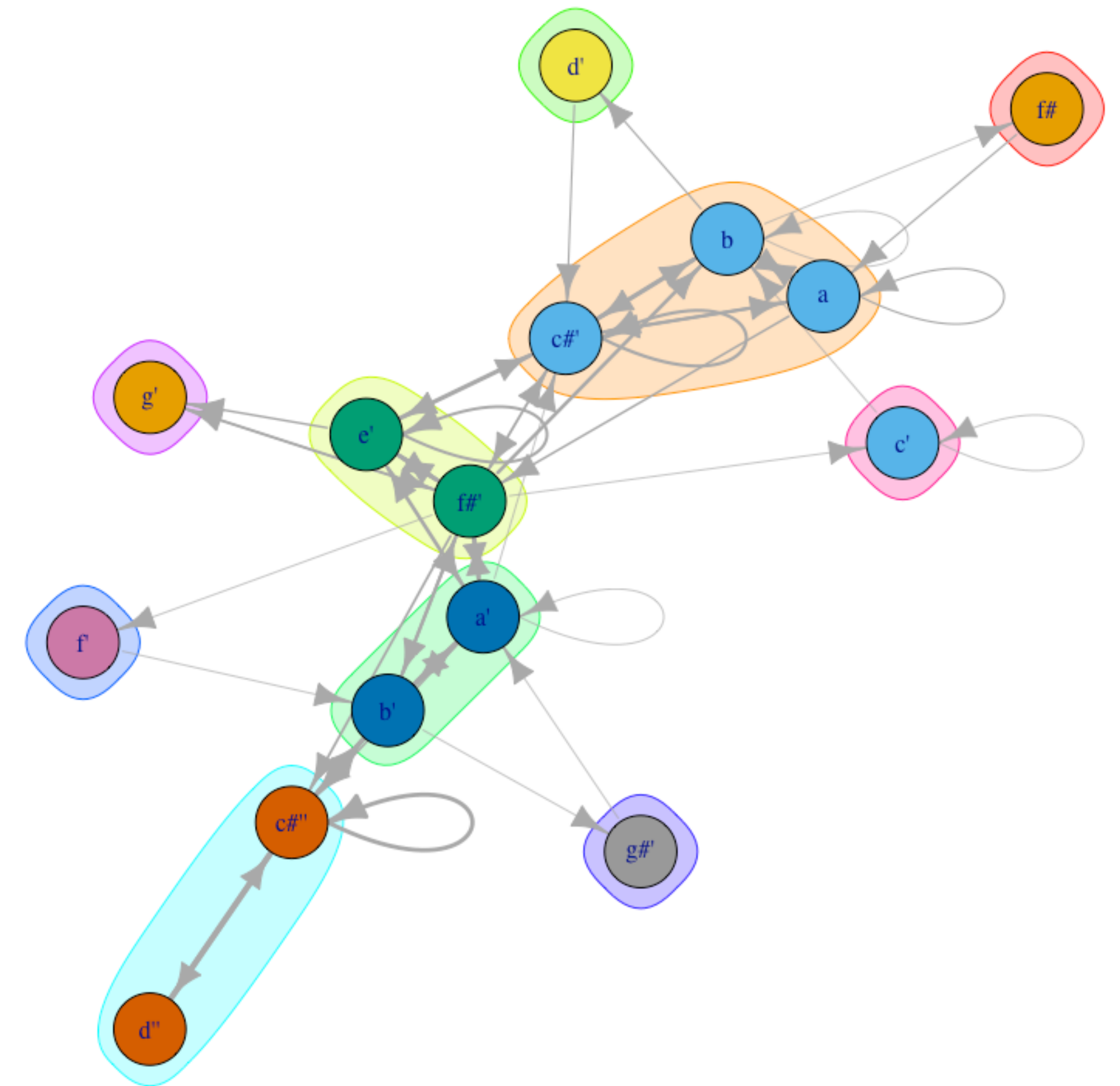
KEYBOARD

▸ Unique cyclic structure resembling an organic element.

▸ 3 different communities -> three different octave range.

▸ (e', a) are the exit points and (b' c#') are the entry points for the top two clusters.
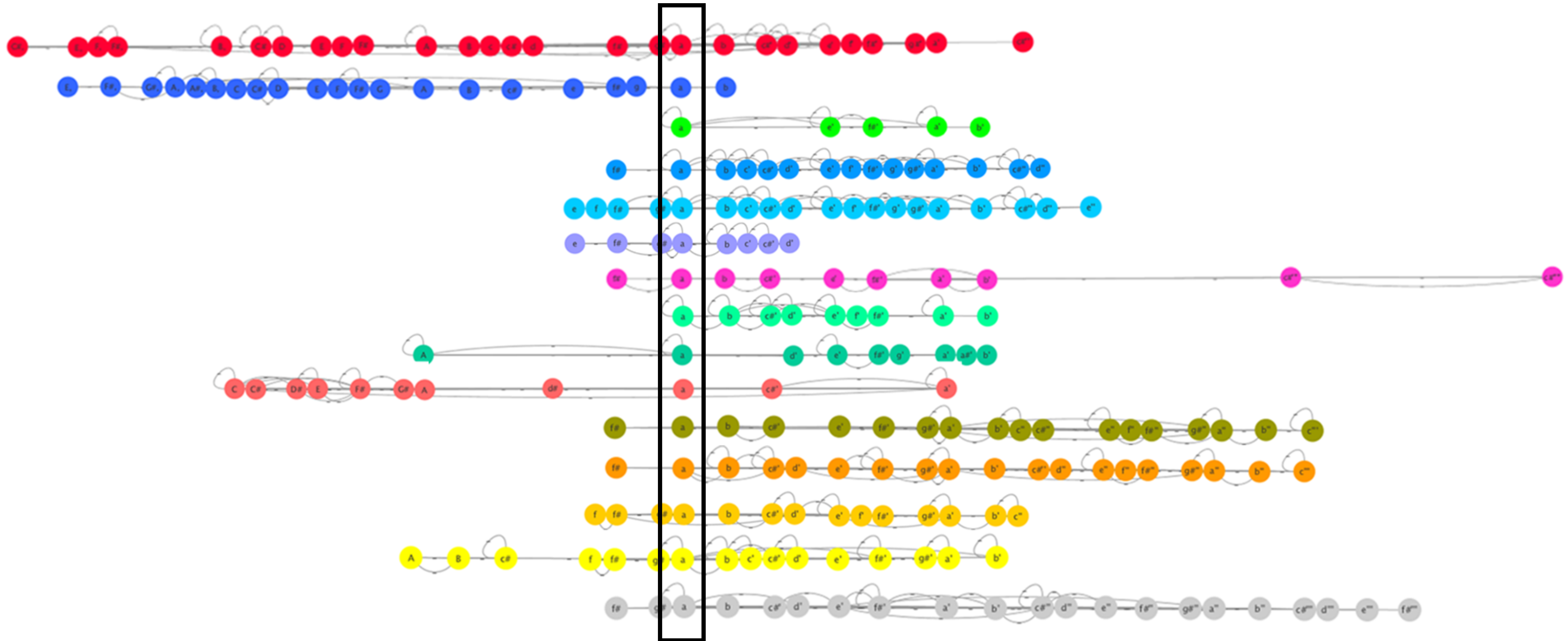
▸ f#' is the only node connecting to the bottom cluster.
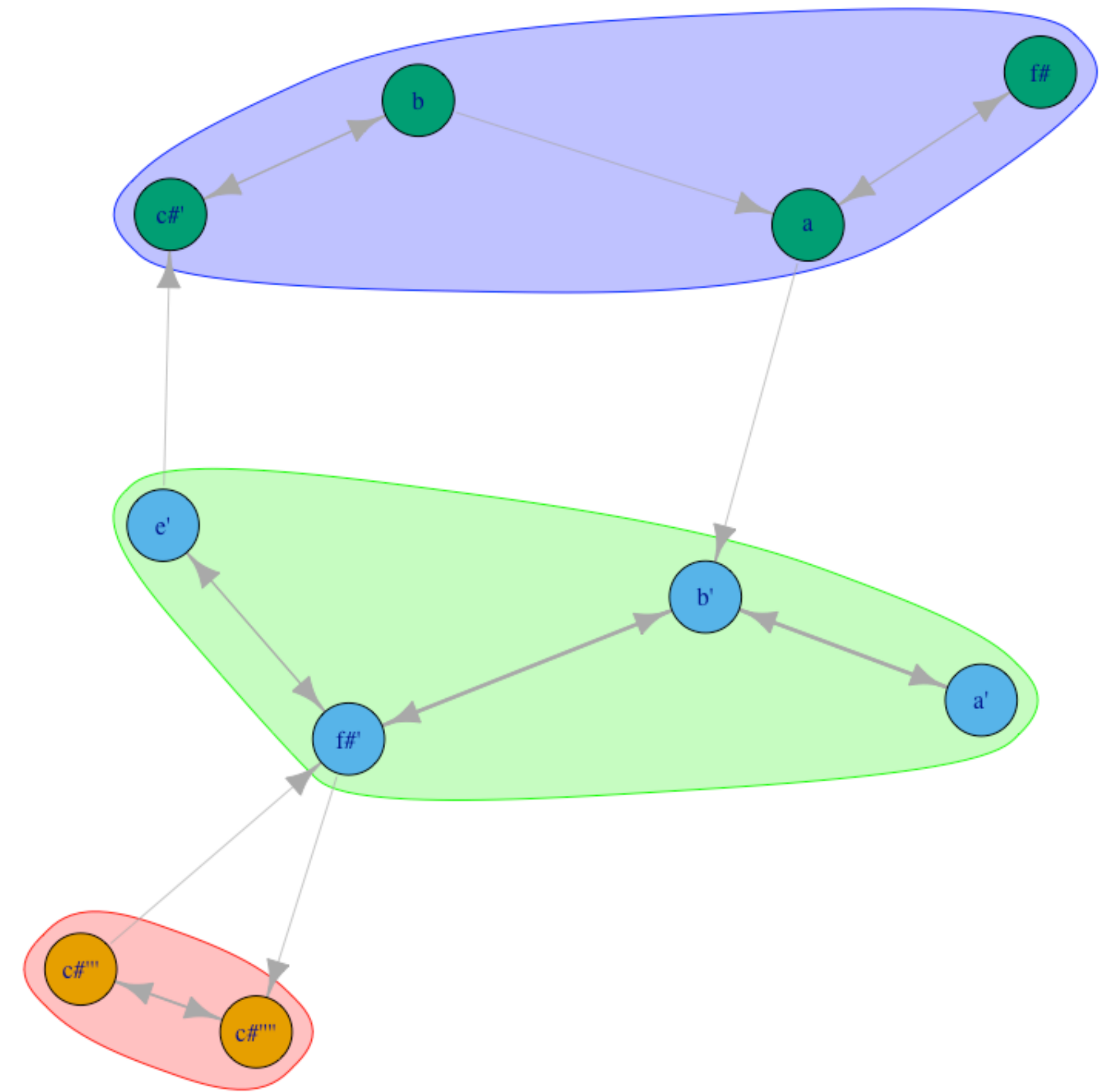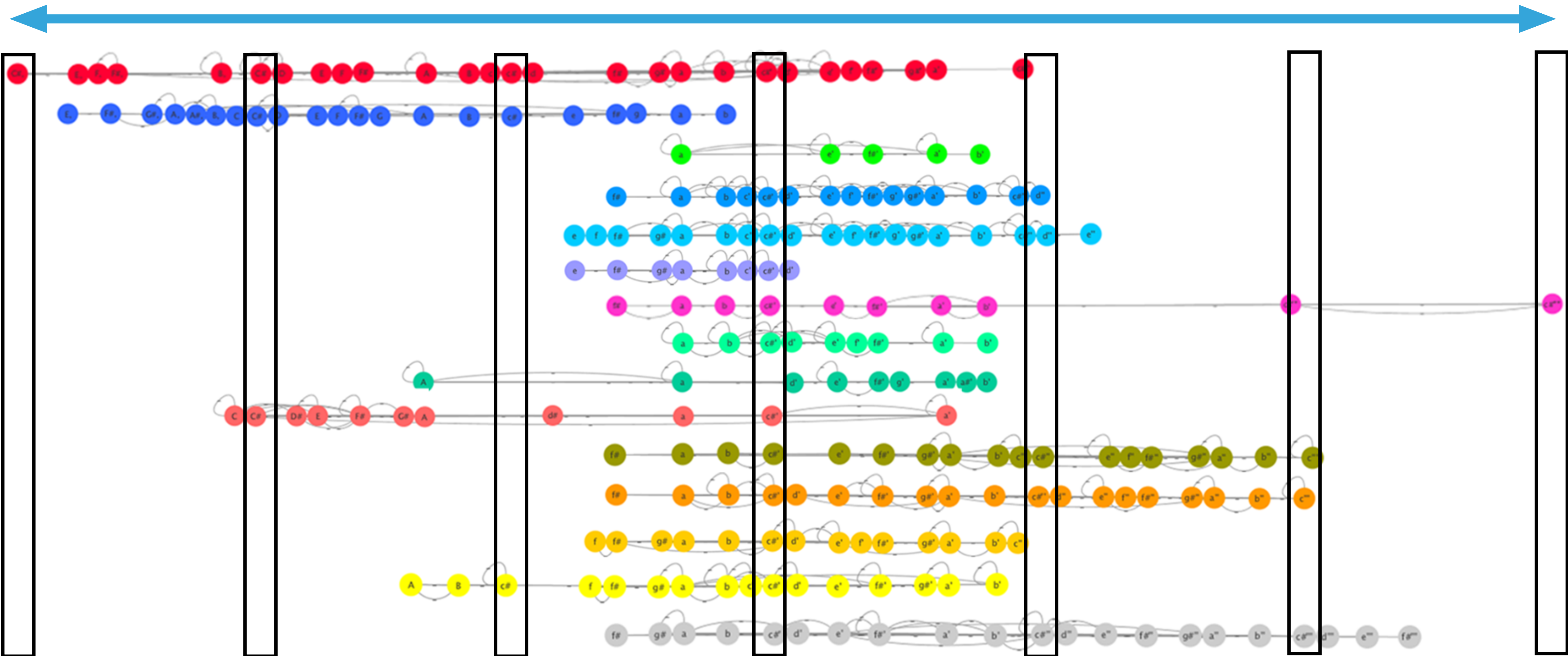
DISTORTION GUITAR

▸ a' -> repeated melody in the intro

▸ 4 different clusters, 1 big cluster with 6 elements, and three 1-element clusters.

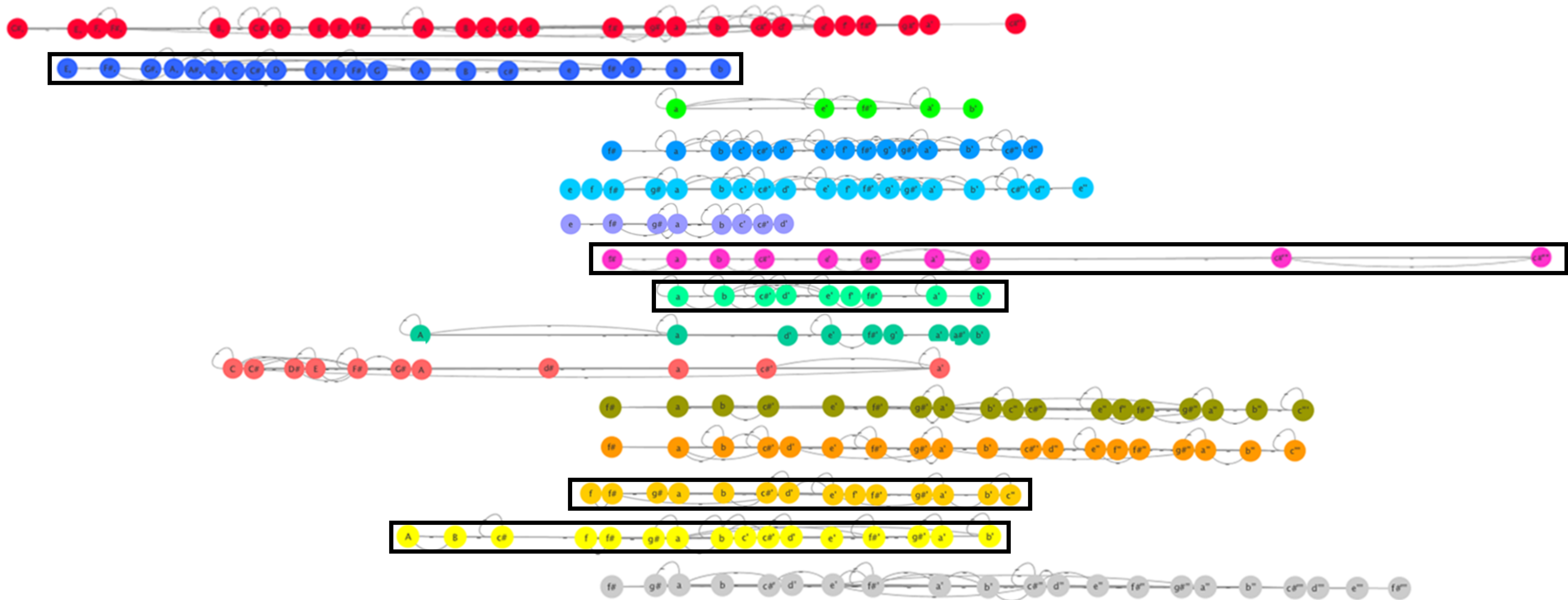▸ b -> a target note for all the other nodes except for a' and b'

COMMONALITY
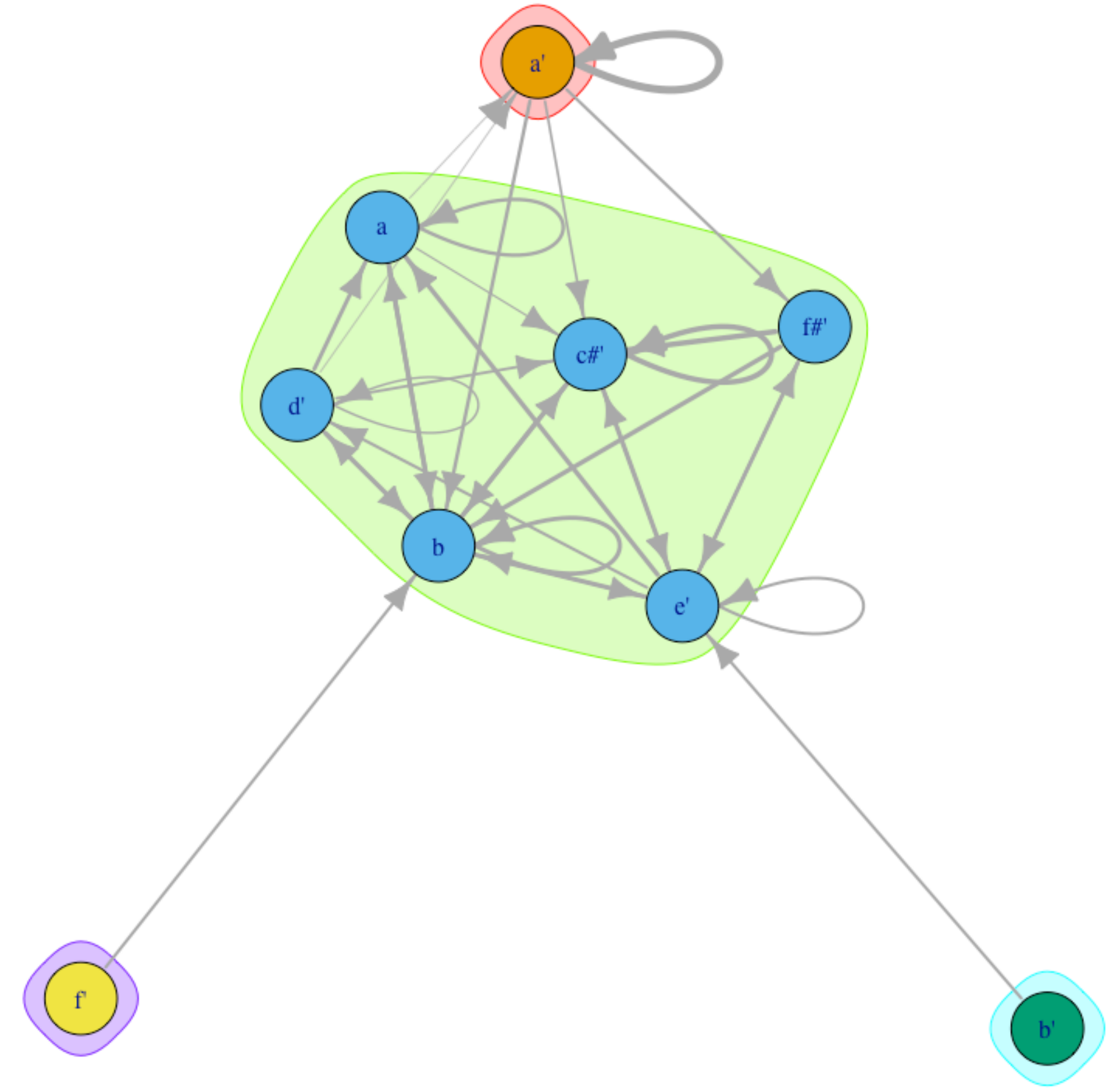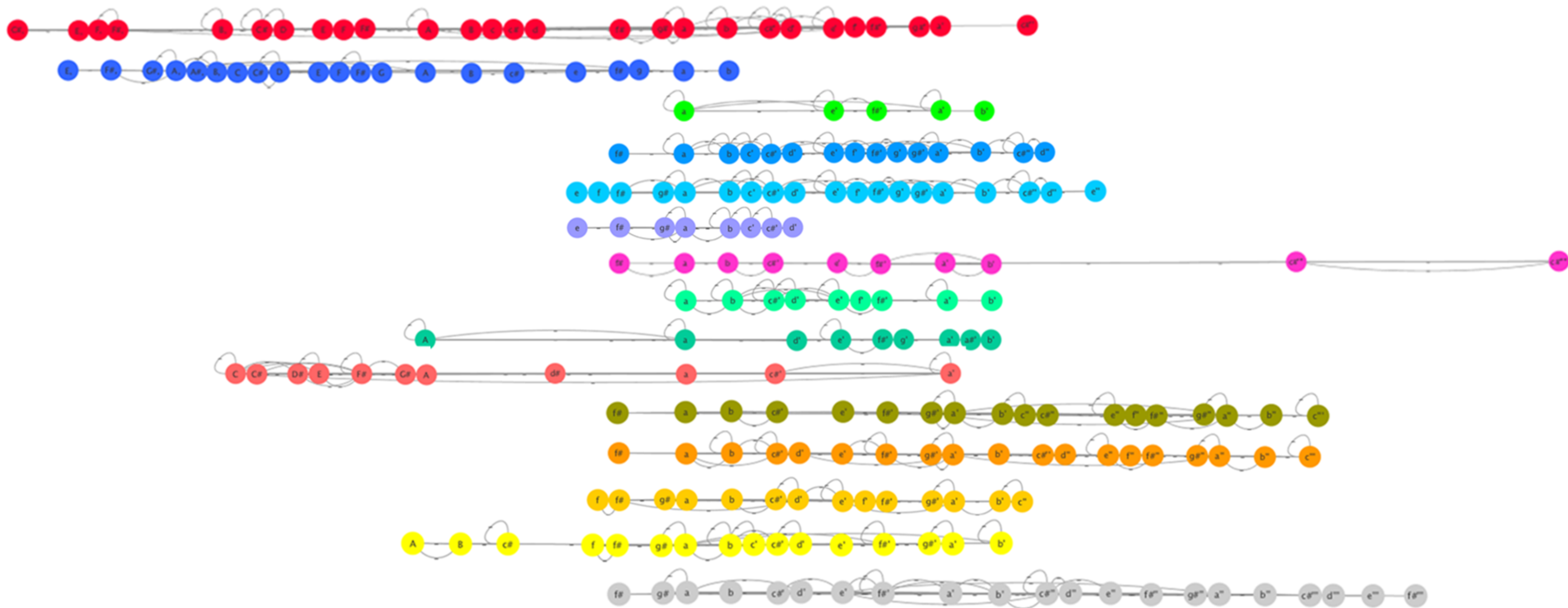
MUSICAL RANGE

MUSICAL RANGE – CONTINUED

THANK YOU