Axiomatic Music Theory: In-class demonstrations

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Week 3 (Pitch, Intervals, Scales, Chords)

- *Droplet* by Sevish (2015). Music written in a 53-note equal-tempered scale.
  https://www.youtube.com/watch?v=xVZy9GUeMqY
- Constructing chords based on their desired period. Requires Mathematica.
  https://stanford.edu/~jonlove/periodchords.nb
- *Musical Actions of Dihedral Groups* by Alissa S. Crans, Thomas M. Fiore, and Ramon Satyendra (2008). A paper which introduces transposition and inversion, and the operations P, L, and R. In particular, the torus is on page 16.
  https://arxiv.org/pdf/0711.1873.pdf
- *Beethovens 9th symphony, Scherzo.* (1824) The 19-note LR path is 1:17–1:37.
  https://www.youtube.com/watch?v=O22ZRhsprQY

Week 5 (Rhythm) Day 1: Bjorklund's Algorithm

In this list, $B(n, k)$ refers to the period n rhythm with k strong beats obtained from Bjorklund's algorithm.

- Illustrating differences in rhythm (same instruments and pitches)
  - *Canon in D* by Johann Pachelbel (1680-1700). `[x...x...]`
    https://www.youtube.com/watch?v=ELbZ5jBVoE0
  - *Rockelbel's Canon* by the Piano Guys (2012). `[x..x....]`
    https://www.youtube.com/watch?v=LV5_xj_yuhs
- `[x.xx][x.xx][x.x.][x.xx]`
  - *William Tell Overture Finale* by Rossini (1829).
    https://www.youtube.com/watch?v=c7O91GDWGPU
- $B(5, 2)$: `[x..x.]`

  - *Tchaikovsky's Symphony No. 6, 2nd movement* (1893).
    https://www.youtube.com/watch?v=yDqCIcsUtPI&t=1258s
  - *Isengard Theme* from *Lord of the Rings*, by Howard Shore (2001).
    https://www.youtube.com/watch?v=KXVtpOHQqvY

- $B(7,3)$: `[x..x.x.]`
  - *Money* by Pink Floyd (1973).
    https://www.youtube.com/watch?v=cpbbuaIA3Ds

- $B(8,3)$ (*Tresillo*): `[x..x.x..]`. All examples starting on the third strong beat.
  - Bèlè folk dance, Martinique (Tresillo combined with `[x...x...]`)
    https://www.youtube.com/watch?v=usog81RjtTQ
  - *St. Louis Blues* by W.C. Handy (1914)
    https://www.youtube.com/watch?v=Gpp75gQ-T6Y
  - *Sandstorm* by Darude (1999)
    https://www.youtube.com/watch?v=y6120QOlsfU

- $B(11,4)$: `[x..x.x..x..]`
  - *Pictures at an Exhibition* by Modest Mussorgsky (1874).
    https://www.youtube.com/watch?v=DXy50exHjes

- $B(12,5)$: `[x..x.x.x..x.]`
  - *Bossobe*, Aka Pygmies (Traditional). Starting on the fourth strong beat.
    https://www.youtube.com/watch?v=xvKDhArxdnA

- $B(16,5)$: `[x...x..x..x..x..]`
  - *Garota de Ipanema* by Antônio Carlos Jobim (1962), performed here by Lys Gainza. Bossa Nova. Starting on the fourth strong beat.
    https://www.youtube.com/watch?v=2lhxvpmldek
  - *Macarena* by Los del Río (1993). Starting on the second strong beat.
    https://www.youtube.com/watch?v=anzzNp8HlVQ

- $B(16,7)$: `[x..x.x.x.x..x.x.]`
  - *Nena Baila* by Ballroom Orchestra & Singers (2009). Samba. (Combined with multiple other rhythms.) Starting on the fourth strong beat.
    https://www.youtube.com/watch?v=v94TLVb63bU&t=863s

- One step of $B(10,4)$: `[x..x..x.x.]`
  - *Mission Impossible Theme* by Lalo Schifrin (1967).
    https://www.youtube.com/watch?v=XAYhNHhxN0A

- One step of $B(16,6)$: `[x..x..x..x..x.x.]`
  - *We Found Love* by Rihanna.
    https://www.youtube.com/watch?v=tg00YEETFzg

Week 5 (Rhythm) Day 2: Polyrhythms

- Drummer Chris Quinlan demonstrating polyrhythms.

  https://www.youtube.com/watch?v=AmyG0t8eoZc

- *Carol of the Bells* by Mykola Leontovych (1914), arranged by Pentatonix (2012). Illustration of a melody based on a 3 : 2 polyrhythm `[x.xxx.]`.

  https://www.youtube.com/watch?v=WSUFzC6_fp8

- *Piano Concerto in A minor* by Edvard Grieg (1868). 9:16–9:40 uses an 8 : 7 polyrhythm.

  https://www.youtube.com/watch?v=Ozn4C3AmEi0&t=555s

- *Surface Tension* by Chris Christodoulou (2013). An example of a 7 : 5 polyrhythm.[1]

  https://www.youtube.com/watch?v=JzJlzGaQFoc

- *Musical Fractals* by Adam Neely. Using All Star by Smash Mouth to demonstrate that rhythm and pitch are the same phenomenon at different scales (0:00–1:30).

  https://www.youtube.com/watch?v=mq0z-sxjNlo

- *Seraphita (Four Orchestral Songs Op. 22)* by Arnold Schoenberg. A musical piece using the hexachord C, $D\flat$, D, F, $G\flat$, A.

  https://www.youtube.com/watch?v=nk9hfkdIyXY

- Speeding up polyrhythms to get chords. Requires Mathematica.

  https://stanford.edu/~jonlove/rhythmtopitch.nb

[1] Thanks Brian for the recommendation!