

Negative substitution

Description

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Cryptographers substitute one symbol for another following a system, so that the recipient who knows the system (and/or a decryption algorithm) can reverse the substitution process to recover the original symbol sequence, i.e. the plain text message.

Substitution is a common operation in mathematics, symbolic logic and computer programming. At various times itâ??s also informed classical architecture. You can substitute an ionic column for a doric column depending on the buildingâ??s purpose. There are rules. It all has be harmonious. In twentieth century terms, architects would configure, rearrange and substitute cells, pods and units according to functional criteria. There might also be rules about disruptive substitutions, as in Mannerist architecture, and as in carnivalesque, experimental, and disruptive architectural interventions.

Symbol arrangement and rearrangement is an an important part of musical notation. So music provides another medium in which substitution comes into play. In this and other respects music exhibits features common to cryptography and architecture.

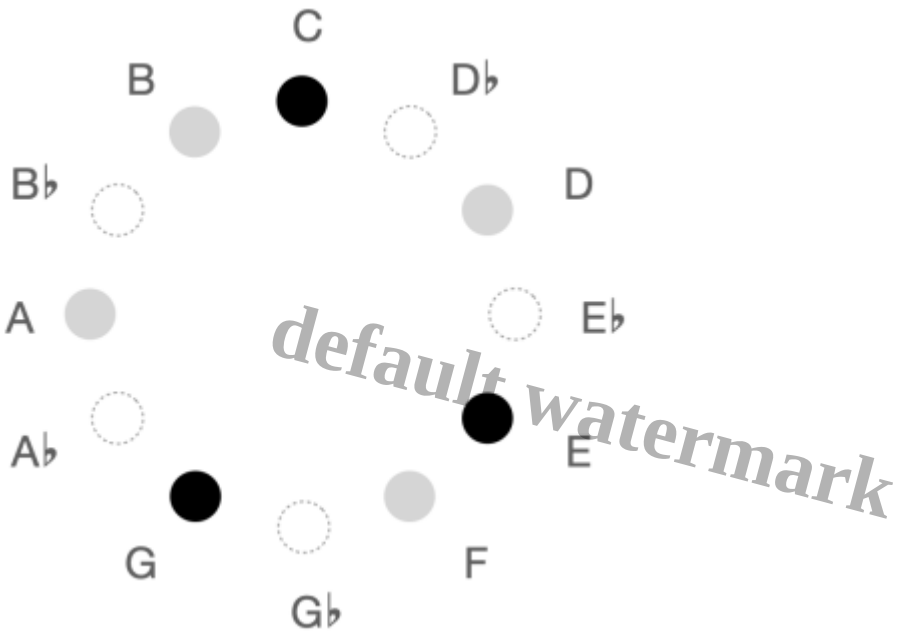
Negative harmony

The past 4 years has seen a renewed interest in a musical substitution process, at least online. Youtube videos show performers presenting versions (covers) of well-known songs in a musical key different to the original, e.g. converting a major to a minor key.

The method is useful as a means of altering the performance of a standard piece of music. Itâ??s a way of generating a variation on a melodic theme. The â??theoryâ?• of negative harmony is more complicated than simply changing key. Itâ??s controversial, and able to be explained, demonstrated and debated on line. Negative harmony fits comfortably into Internet culture. As a product of the social media age, negative harmony is in the company of food photography, TikTok pranks, and ASMR.

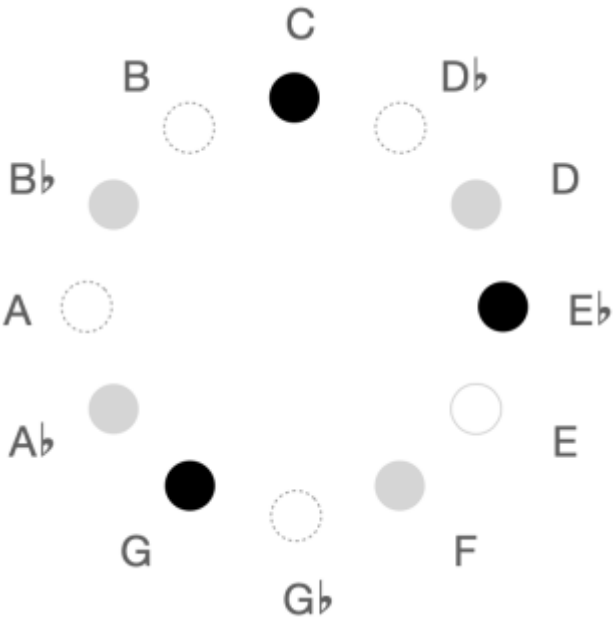
A light-hearted presentation by Tommaso Zillio provides a helpful explanation of the theory. Iâ??ve adapted his explanation here.

Here I have arranged the 12 notes of the chromatic scale as a series of dots positioned in a circle. The dots shaded black and grey belong to the key of C major. The dots shaded black are the â??stableâ?• notes of the scale. The theory is that when placed in a melody, or simple cadence, notes tend to gravitate towards their adjacent stable notes. In the key of C major, C, E, and G are stable as they belong to the tonic (main) chord of the key. They are the first three overtones of the note middle C (261.63 Hz) as played by a musical instrument. The grey dots on this circle are the â??activeâ?• notes. They are the notes on the move as if seeking stability.

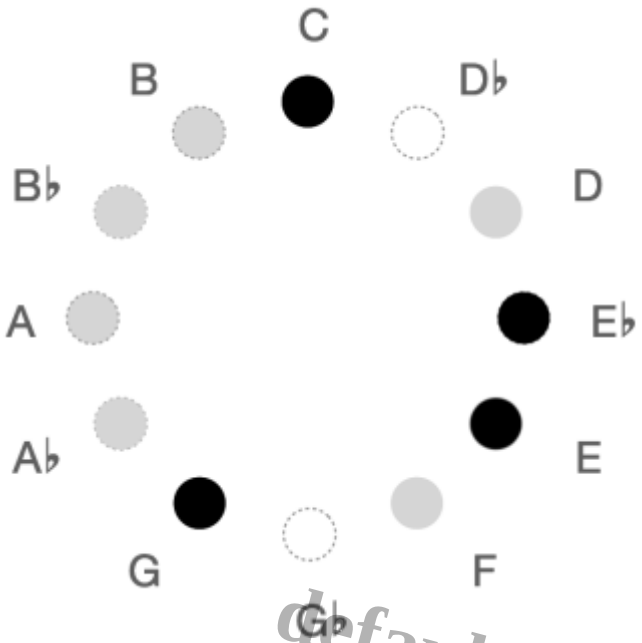


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Here is the same chromatic circle but with the stable (black) and active (grey) notes of the C harmonic minor scale indicated.

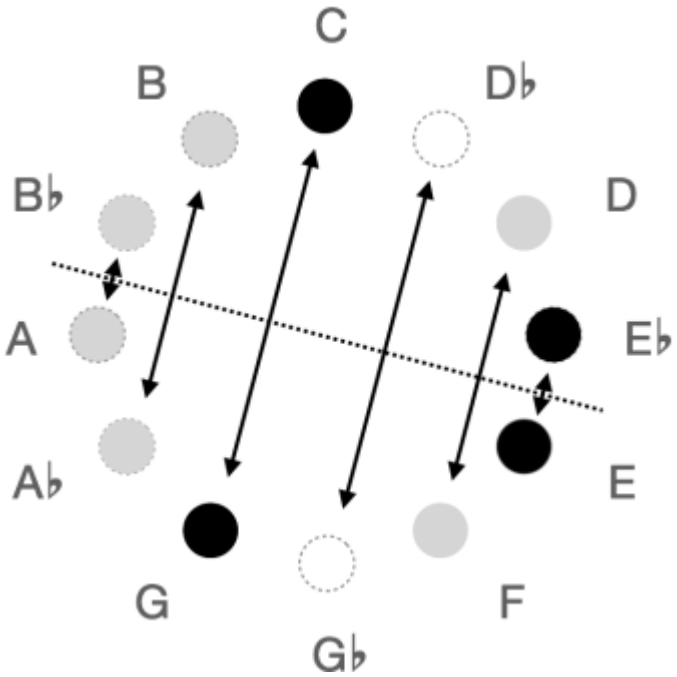


The combination of notes from both scales looks like this.



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Thereâ??s one axis of symmetry in this circle. Hereâ??s the same circle with the axis drawn in. This is the only diameter line on the circle about which there is axial symmetry. The arrows across the axis indicate how notes can be substituted under negative harmony.



Strangely familiar

According to the theory, as long a melody is within the same major or minor key a composer can vary the melody by swapping some or all of the notes across this axial line. As long as the musician keeps to the same rhythm and dynamics of the original melody, the new variation will preserve the familiar tensions and resolutions of the original.

Hereâ??s the opening phrase of Beethovenâ??s 5th Symphony (in C major for simplicity).

G G G E F F F D

Applying the substitutions indicated on the combined chromatic circle above, the negative harmony version is

C C C Eâ? D D D F

Hereâ??s a mesmerising version of the entire movement created by Luke Craig.

- Craig, Luke M. 2017. Beethoven, Symphony 5, 1st movement: Negative Harmony. *Negative Harmonizer*, 25 September. Available online: https://www.youtube.com/watch?v=NDDE3Omt-DY (accessed 21 August 2021).

There are many example online of this kind of melody substitution (search â??negative harmony coversâ?• on Youtube) for classical and popular music standards, though the application of the substitution requires more explanation in the case of modulations between keys, melodic minor, other modes, and chords.

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- Levy, Ernst. 1985. *A Theory of Harmony*. Albany, NY: SUNY Press. Originally written in French (1940-41).
- Zillio, Tommaso. 2019. How To Write Chord Progressions With NEGATIVE HARMONY [Simple Explanation]. *MusicTheoryForGuitar*, 4 February. Available online: https://www.youtube.com/watch?v=qHH8siNm3ts&t=476s (accessed 17 August 2021).

Note

- As a further connection with cryptography â?¦ the opening rhythm of Beethovenâ??s 5th is the letter â??Vâ?• in Morse Code, a happy coincidence taken up by the Allies after WWII.

Category

1. Music

Tags

1. negative harmony

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