Musical Homotopy: A Topological Study of Voice Leading Groups and Its Application to Contrapuntal Music Genres

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Voice leading in music is a key element of the Western tradition. It is closely associated with homotopy, the exploration of chordal paths in higher dimensional configuration spaces. Musicians intuitively explored these spaces centuries ago and developed simple rules to ensure musical quality, long before mathematicians developed the concepts needed to describe them. This work develops the formal mathematical framework for analyzing voice leading, making explicit the musician's implicit knowledge and allowing the appreciation of the deep and inherently mathematical knowledge of the practical musician. For the first time, a software package has been developed that uses the mathematics and music theory to perform a comprehensive analysis of bijective and non-bijective voice leadings and classify them for performability. This tool is immensely useful for composers to quickly identify the performable voice leadings from among all the theoretical contrapuntal possibilities, and is being productized for general use.

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