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Facility Location and Assignment Problems with Applications to Computational Musicology

In this lecture musical rhythm is represented symbolically, which renders it eminently suitable for analysis from the discrete-mathematical and computational points of view [1]. Indeed a rhythm timeline may be represented as a binary sequence in which each bit denotes one unit of time, and the one-bits correspond to sounds (striking an instrument such as a drum), whereas the zeros correspond to silences. We consider cyclic rhythms, and thus the one-bits of the binary sequence may be mapped to points on a circular lattice. In this setting several problems in music theory, music information retrieval, and computational musicology fall squarely in the domain of operations research, as obnoxious facility location problems [4], [5], [6], as well as assignment problems defined on the circular lattice [1]. Here we review several obnoxious facility location problems relevant to the design of desirable musical rhythms and scales, and report recent results on several new versions of linear assignment problems, from the points of view of their musical relevance and computational efficiency [2], [3].

References

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