

Demo: Counterpoint by Construction

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Abstract

Western music of the common practice period tends to loosely follow sets of rules which were developed over time to help ensure the aesthetic quality of the composition. Rules in developed in particular for harmony ([Piston et al. 1987]) and counterpoint ([Fux and Mann 1965]), and continue to be taught to music students both to understand the music of that time and because they continue to provide a foundation for modern art and popular music. To help both analyze and synthesize tonal music, it is worthwhile to attempt to encode these rules into a programming language, with functional programming languages being particularly well-suited to this task. Recently quite a bit of work has been done in Haskell ([De Haas et al. 2011, 2013; Koops et al. 2013; Magalhães and de Haas 2011; Magalhães and Koops 2014]) to encode the rules of harmony, but little work seems to have been done with counterpoint ([Samozvancev 2016]). Furthermore Haskell’s type system, lacking full dependent types, is not strong enough to encode the required logic in a natural way, and requires using a number of extensions.

In this demonstration of work in progress, we present Music Tools ([Cong and Leo 2019]), a library of small tools that can be combined functionally to help analyze and synthesize music. The library is written in the dependently typed language Agda (with Haskell used for I/O), which allows a simple and natural encoding of rules. We demonstrate its use in writing species counterpoint following Fux ([Fux and Mann 1965]), in which type system ensures by construction that the rules are followed. We show how this both aids human composition and allows for computer-generated creation of correct counterpoint. We also contrast this work to recent use of machine learning to generate natural-sounding counterpoint which does not necessarily follow specific rules ([Huang et al. 2017]). Finally we indicate future planned work including extension to handle functional harmony.

Keywords keyword1, keyword2, keyword3

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