

# Accepted Manuscript

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PII: S0020-0255(18)30716-3  
DOI: <https://doi.org/10.1016/j.ins.2018.09.015>  
Reference: INS 13926

To appear in: *Information Sciences*

Received date: 26 February 2018  
Revised date: 29 August 2018  
Accepted date: 9 September 2018

Please cite this article as: Uzay Bora, Baris Tekin Tezel, Alper Vahaplar, An Algorithm for Spelling the Pitches of Any Musical Scale, *Information Sciences* (2018), doi: <https://doi.org/10.1016/j.ins.2018.09.015>



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# An Algorithm for Spelling the Pitches of Any Musical Scale

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## Abstract

In this paper, we propose a method for the fundamental task of optimally spelling the pitches of any given musical scale. The input, given as a sequence of pitch-class numbers, can be any randomly compiled subset of the chromatic scale, resulting in either a traditional/known scale or a novel/unknown one. The method consists of generating all potential solutions containing all possible spellings for the pitch classes in a given input sequence, and subjecting them to five filtering stages to find the correct solution. We present an algorithm to accomplish this task, and demonstrate some exemplary outputs. Constructing also a modified version of the algorithm to retrieve and execute all possible input sequences, we also present distributions of various outcomes of the procedure over the input universe to exhibit an overall view of results to be produced by the algorithm, along with some findings obtained by this process.

*Keywords:* heuristic methods, scales, pitch spelling, scale spelling, intervals, diatonicism

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## 1. Introduction

This work presents an application of the approach of searching a solution space using a heuristic method to a task in processing musical data, which involves spelling pitches of musical scales. (For some other recent examples of heuristic search approaches used in diverse domains, see Costa et al. (2017), Martinez-Gavara et al. (2017), Djenouri and Comuzzi (2017), Wang et al. (2018), de França (2018).) Pitch spelling refers to the process of deciding the proper letter name for a pitch (such as, choosing among D $\sharp$ , E( $\natural$ ), F $\flat$  for

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