



HAL
open science

Trance generation by transformation

Darrell Conklin, Louis Bigo

► **To cite this version:**

Darrell Conklin, Louis Bigo. Trance generation by transformation. 8th International Workshop on Machine Learning and Music, Aug 2015, Vancouver, Canada. hal-01798675

HAL Id: hal-01798675

<https://hal.science/hal-01798675>

Submitted on 23 May 2018

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Trance generation by transformation

Darrell Conklin^{1,2} and Louis Bigo¹

¹ Department of Computer Science and Artificial Intelligence
University of the Basque Country UPV/EHU, San Sebastián, Spain

² IKERBASQUE, Basque Foundation for Science, Bilbao, Spain

1 Introduction

Music generation methods can be broadly divided into two categories: *rule-based* methods use specified rules and constraints for style emulation and algorithmic composition; *machine learning* approaches generate musical objects by sampling from statistical models built from large corpora of music. In this paper we apply a mixed approach, *generation by transformation*, which conserves structural features of an existing piece while generating variable parts with a statistical model (Bigo and Conklin, 2015; Goienetxea and Conklin, 2015).

In recent years several music informatics studies have started to explore *electronic dance music* (EDM) using audio analysis (Diakopoulos et al., 2009; Collins, 2012; Rocha et al., 2013; Yadati et al., 2014; Panteli et al., 2014). The symbolic generation of EDM is a new problem that has been explored in the work of Eigenfeldt and Pasquier (2013), who use a corpus of 100 EDM songs for the extraction of low order statistics. In our approach to EDM generation, a single *template piece* in Logic Pro X (LPX) format is transformed using a statistical model. As in most digital audio workstation formats, an LPX project contains effects, instrumentation, and orchestration, which can all be inherited by a transformed piece.

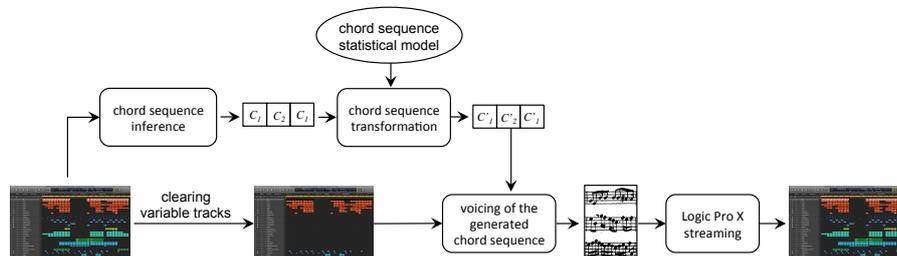
2 Methods

In this work we focus on generation of the EDM subgenre of *trance*. The approach to trance generation follows three steps: chord sequence extraction and transformation; chord voicing; and LPX streaming.

For chord sequence extraction, the MIDI tracks having pitch content are extracted from the original LPX template. A chord sequence (all chords with duration and onset information) and key region segmentation are inferred from the set of pitch tracks using automated harmonic analysis. A new chord sequence is then generated using iterative random walk (Whorley and Conklin, 2015) on a learned statistical model of chord sequences. The chord generation method conserves semiotic patterns (sequences of chord variables) during the statistical generation process (Conklin, 2015).

Following chord sequence transformation, the chord sequence is voiced in a way that transforms the original pitches respecting their original harmonic function in the template and attempting to minimize their distance to the template

itches. Various different search strategies for chord voicing have been implemented (Bigo and Conklin, 2015).



After transformation, the pitch content of the template piece is *streamed* back into LPX using the MIDI communication protocol to record transformed generated events into the variable tracks of the sequencer while leaving invariant tracks (e.g. percussion, audio effects: colored red in the figure above) and track effects unmodified. The figure shows this process where the lower sequence, cleared of variable tracks, has been filled again with transformations of the original LPX template (tracks colored in blue or green).

3 Results and discussion

Two professional trance templates (*Uplifting Trance Logic Pro X Template by Insight*, and *Uplifting Trance Logic Pro X Template by CJ Stone*, Daw Templates, Germany) were used to test the trance generation method. For example, the first template has the chord structure:

$$(f, Db, f, c)\{2\} + (f, Db, Ab, Eb)\{11\} + (f, Db, f, c)\{4\} + f$$

where $\{n\}$ refers to n repetitions of the sequence in $()$. To transform this piece, several possible semiotic patterns can be used, for example:

$$\begin{aligned} &\circlearrowleft(ABAC) + \circlearrowleft(ABDE) + \circlearrowleft(ABAC) + A \\ &\circlearrowleft(ABCD) + \circlearrowleft(XXXX) + \circlearrowleft(ABCD) + A \\ &\circlearrowleft(AXXX) + \circlearrowleft(AXXX) + \circlearrowleft(AXXX) + A \end{aligned}$$

where the labels represent variables that map to chords, and \circlearrowleft indicates a cyclic pattern that is repeated an indefinite number of times (see Conklin, 2015). The first pattern thus represents a direct abstraction of the template piece; the second preserves repetition of the first and third loop chord sequences; the third only enforces that the first chord (the assumed tonic) is coherent throughout the piece.

The evaluation of music generated by statistical models is always a fascinating issue and naturally any final determination must be made by human listeners. The approach described herein has also been used to generate experimental stimuli for trance loop evaluation (Agres et al., 2015), using a model trained on a small corpus of trance anthem loops, with many of the sequences being rated highly by listeners.

Acknowledgements

This research is supported by the project Lrn2Cre8 which is funded by the Future and Emerging Technologies (FET) programme within the Seventh Framework Programme for Research of the European Commission, under FET grant number 610859. Thanks to Kat Agres, Dorien Herremans, and Kerstin Neubarth for valuable discussions on this research.

References

- Agres, K., Bigo, L., Herremans, D., and Conklin, D. (2015). The effect of repetitive structure on enjoyment and altered states in uplifting trance music. In *2nd International Conference on Music and Consciousness (MUSCON 2)*, Oxford.
- Bigo, L. and Conklin, D. (2015). A viewpoint approach to symbolic music transformation. In *11th International Symposium on Computer Music Multidisciplinary Research (CMMR 2015)*, pages 56–70, Plymouth.
- Collins, N. (2012). Influence in early electronic dance music: An audio content analysis investigation. In *Proceedings of the 13th International Society for Music Information Retrieval Conference (ISMIR 2012)*, pages 1–6, Porto, Portugal.
- Conklin, D. (2015). Chord sequence generation with semiotic patterns. In *8th International Workshop on Music and Machine Learning (MML 2015)*, Vancouver.
- Diakopoulos, D., Vallis, O., Hoehenbaum, J., Murphy, J. W., and Kapur, A. (2009). 21st century electronica: MIR techniques for classification and performance. In *Proceedings of the 10th International Society for Music Information Retrieval Conference (ISMIR 2009)*, pages 465–470, Utrecht, The Netherlands.
- Eigenfeldt, A. and Pasquier, P. (2013). Considering vertical and horizontal context in corpus-based generative electronic dance music. In *Proceedings of the 4th International Conference on Computational Creativity (ICCC 2013)*, pages 72–78, Sydney, Australia.
- Goienetxea, I. and Conklin, D. (2015). Transformation of a bertso melody with coherence. In *Proceedings of the 5th International Workshop on Folk Music Analysis (FMA 2015)*, pages 56–58, Paris, France.
- Panteli, M., Bogaards, N., and Honingh, A. (2014). Modeling rhythm similarity for electronic dance music. In *Proceedings of the 15th International Society for Music Information Retrieval Conference (ISMIR 2014)*, pages 537–542, Taipei, Taiwan.
- Rocha, B., Bogaards, N., and Honingh, A. (2013). Segmentation and timbre similarity in electronic dance music. In *Proceedings of the Sound and Music Computing Conference (SMC 2013)*, pages 754–761, Stockholm, Sweden.
- Whorley, R. P. and Conklin, D. (2015). Improved iterative random walk for four-part harmonisation. In *International Conference on Mathematics and Computation in Music (MCM 2015)*, LNAI 9110, pages 64–70, London. Springer.
- Yadati, K., Larson, M., Liem, C., and Hanjalic, A. (2014). Detecting drops in electronic dance music: Content-based approaches to a socially significant music event. In *Proceedings of the 15th International Society for Music Information Retrieval Conference (ISMIR 2014)*, pages 143–148, Taipei, Taiwan.