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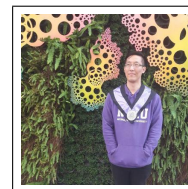
Education

2020 – 2022	**National Cheng Kung University, Taiwan**, *Master of Science in Computer Science*.
2013 – 2018	**National Tsing Hua University, Taiwan**, *Bachelor of Science in Computer Science*.

Skills

Machine Learning Research and Tool Development for Music Application

Language: Python, C/C++, Rust

Work Experiences

October 2022 - January 2023	Research Assistant, Research Center for IT Innovation, Academia Sinica
September 2020 - June 2022	Research Assistant, Studio of Computer Research on Music and Multimedia Lab, Computer Science Department, National Cheng Kung University

Publications

C.P. Tan, Alvin W.Y. Su, Y.H. Yang. *Melody Infilling with User-Provided Structural Context*. in Proc. *International Conference on Music Information Retrieval*, 2022.

C.P. Tan, C.J. Chang, Alvin W.Y. Su, Y.H. Yang. *Music Score Expansion with Variable-Length Infilling*. in *Late Breaking Demo, International Conference on Music Information Retrieval*, 2021.

Publication Abstracts

Melody Infilling with User-Provided Structural Context.

This paper proposes a novel Transformer-based model for music score infilling, to generate a music passage that fills in the gap between given past and future contexts. While existing infilling approaches can generate a passage that connects smoothly locally with the given contexts, they do not take into account the musical form or structure of the music and may therefore generate overly smooth results. To address this issue, we propose a structure-aware conditioning approach that employs a novel attention-selecting module to supply user-provided structure-related information to the Transformer for infilling. With both objective and subjective evaluations, we show that the proposed model can harness the structural information effectively and generate melodies in the style of pop of higher quality than the two existing structure-agnostic infilling models.

Music Score Expansion with Variable-Length Infilling.
In this paper, we investigate using the variable-length infilling (VLI) model, which is originally proposed to infill missing segments, to "prolong" existing musical segments at musical boundaries. Specifically, as a case study, we expand 20 musical segments from 12 bars to 16 bars, and examine the degree to which the VLI model preserves musical boundaries in the expanded results using a few objective metrics, including the Register Histogram Similarity we newly propose. The results show that the VLI model has the potential to address the expansion task.

Master Thesis

Structure-Aware Music Score Infilling via Transformer-based Models.
The purpose of this thesis is to apply music structure information to the Transformer- based models of automatic music score generation systems. In many music score gener- ation applications, we focus on music score infilling, i.e., generating a music sequence to fill in the gap between given past and future contexts. Known researches have demon- strated that prompt-based conditioning approaches could make great results in local smoothness among past context, future context, and the generated sequence. However, these cannot guarantee the repeatness and similarity corresponding to the structures of musical context. Therefore, we propose a structure-based conditioning approach, which hires a novel attention-selecting module and explicitly makes the model refer to the given structure information in the training process, on a Transformer-based model, TransformerXL, to solve the problem of the loss of structural completeness. We report on objective and subjective evaluations of the proposed models and variants of conven- tional prompt-based baselines, including comparisons of melody, rhythm and tonality, and human listening tests, to show that our approach greatly improves the generation of pop music by efficiently taking advantage of music structure information.

使用 Transformer 類別深度學習模型於結構資訊相關的樂譜填空生成之應用.
本研究主要探討音樂段落資訊對於 Transformer 的衍伸模型於樂譜填寫之應用。 樂譜填寫屬於條件生成類型的問題:給予前後語境,生成一串音樂序列來填補中間的空缺。在已知關於音樂填寫的研究中,對於生成結果局部性順暢的問題已經有了系統性的解決方法。 然而,基於提示的條件狀況沒辦法保證生成結果的結構性以及相似性,換句話說,生成結果是否符合音樂整體的架構以及生成的結果是否與對應的音樂段落相似。 因此,在本研究中,我們提出了基於條件狀況的方法,藉由在訓練過程中明確的要求模型參考所提供的段落資訊,並增加了全新的注意力選擇模組於 Transformer 的衍生模型,讓音樂生成的過程可以更有效率地使用使用者提供的段落資訊提示,來解決基於提示條件狀況的音樂生成結果中所缺失的結構性和相似性的問題。 在實驗方法中,我們與其他人的研究結果做比較,衡量方式包含旋律,節奏與調性的相似度計算,以及志願者的聽力測試,來顯示我們所提出的新架構能更有效率地利用音樂段落資訊。

Side Projects

使用Rust開發四軸飛行器 (進行中).
使用Rust開發四軸飛行器,並使用Rust開發相關的控制程式。 開發硬體為Respberry Pi Pico,目標為以Rust為開發語言,設計簡易的OS以及所需的driver,OS包含thread和timer並提供基本的system call,而驅動的部分包含藍芽以及馬達,涉及的範圍包含GPIO、PWM、UART等韌體相關程式撰寫。