Quantum Computer Music: Foundations and Initial Experiments

(as pdf here)

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Summary

The paper covers an introduction to Markov chains and random walks. Then it moves on to the presentation of the Basak-Miranda algorithm, which is a generative music algorithm. In the end, one can also find an appendix which gives us an introduction to the fundamentals of quantum computing needed for a better understanding of the matter. The whole paper comes with graphs, tables, diagrams and Jupyter Notebooks.

Objective

Designing a new quantum algorithm for generating music (preferably one that would take advantage of quantum computing)

Research done

The researchers introduced the concept of the Oracle matrix used for selecting the next pitch in a musical snippet. Afterwards, the proposed algorithm uses amplitude amplification (a.k.a amplitude remixing).

New contributions

The Basak-Miranda algorithm takes advantage of a fundamental property of quantum physics, known as constructive and destructive interference, for selecting steps on a Markov chain.

Future Directions

The researchers hypothesise that the Barak-Miranda algorithm would work faster on a quantum computer than on a classical one for significant large chains and a higher number of target states. Nowadays, the algorithm can be still run on a classical computer with the same efficiency as on the quantum one.