Quantum Computer: Hello, Music!

(as pdf here)

Written by: Eduardo Reck Miranda (ICCMR, University of Plymouth, UK)

Summary

In the beginning, the paper gives us a short introduction to quantum computing. In the next part, the author presents the concept of a quantum vocal synthesiser. The last part consists of a musical sequencer design and also contains a summary of quantum random walks. Both of these techniques use a client-server scheme.

Objective

E. R. Miranda stated that the main focus of quantum computing these days is on developing scientific and engineering systems. On the other hand, we might also consider its usage in different fields, e.g. the entertainment industry. The researcher aimed to design quantum mechanisms and techniques to work with music, such as approaches to creating, performing, listening to and distributing it.

Research done

The author didn't introduce much research in the paper. For more detailed information on some aspects, refer to Quantum Computer Music: Foundations and Initial Experiments. Instead, he presented two strategies of operating with music – quantum vocal synthesiser and musical sequencer.

New contributions

A singing voice synthesiser – synthesises simulations of the singing voice. It takes a human's voice as input, then prepares data and returns the measurement using quantum hyper-die. The outcome produces synthesised sounds. Miranda pointed out the usage of a method called FOF.

A musical sequencer – is a system that generates music snippets using quantum random walks. We let quantum random walk circuits run on a server, and the system sends the results back to the client. Then the client translates the measurements into a sequence of musical notes and encodes them into the MIDI format. Unlike synthesising sounds, this allows us to connect it to some third-party music software.

Future Directions

We can implement the systems mentioned above on quantum computers besides the classical ones. The quantum walk sequencer is one of the first tries to design a quantum counterpart to the classic algorithmic music composition approaches. Nowadays, we face the problem that the sequencer can only have a limited number of musical parameters to work with (only eight notes). To operate with a more significant number of parameters, we have to build a much larger quantum circuit and deal with decoherence. For efficient dealing with that, we need to improve quantum hardware and find better error correction methods.