

Applications of Quantum Randomness: From Rabi Oscillations to Fourier Axis Controlling the Musical Timbre

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Abstract. Randomness has attracted great interest in the field of music composition for quite some time. As early as 1962, Iannis Xenakis started exploring a stochastic approach to randomness by using computer-based interlinking probability functions to determine compositional structure, pitches and their durations. Soon after, composers and music technologists started to explore randomness with various methods of algorithmic compositions, sometimes with the help of artificial intelligence. However, in most cases, the source of randomness they used was in fact deterministic in nature. That is to say, the random numbers that they employed are imperfect in the strict sense (simply put, perfect random numbers never have repeating patterns). Moreover, the method in which they produced such randomness was extrinsic to the method in which randomness was applied. In this project, we attempt to take a further step by directly producing sound events from the genuine quantum true randomness of quantum physical systems. Through this method, we aim at achieving a new sense of aesthetic effect in music which derives from the true randomness that prevails in the natural quantum world.

Keywords: Quantum randomness, Rabi oscillation, musical timbre, computer-assisted composition.



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