The Application of Grover Quantum Algorithm in Lifting Stage Restoration Problem

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Quantum computing will be the most powerful computing way within 30 years due to the quantum superposition state. Recent studies are mainly focused on the principle or hardware of it, and there is a gap in the application of quantum algorithms in real life. So the goal of this project is to find a way that can connect quantum algorithm to daily life problems, taking increasing the restore speed of lifting stage as an example. According to my research, the lifting stages are mainly restored one part by one part artificially, which is slow and not accurate. Inspired by the game Light Out, I associate the adjacent parts of the lifting stage to let them go up and down together, so that there is a channel to realize quantum algorithms and a platform to accelerate stage restoration process. Then I introduced Grover, a search quantum algorithm into this problem. Linear algebra and basic mathematical assumptions of quantum computing were used to create a model, which can help applying Grover to the problem, based on the association. I used the quantum composer provided by ibm to carry out the model. The results show that the accuracy is as high as 99.8%, and the speed can be improved by 44.5%. So this model can successfully apply quantum algorithm to the restoration of the lifting stage, and can be applied to other optimization problems that adjust a group of binary state things to a specific state.

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