Quantum Search Algorithms for Database Query Processing

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For two functions f and g, a pair of (x, y) such that $f(x) = g(y)$ is called a claw. Finding a claw is essentially the same as finding a pair of tupples (t_1, t_2) from two relational tables, T_1 and T_2, such that (t_1, t_2) constitutes a single tupple in the join table of T_1 and T_2. Thus the claw finding problem is closely related to the database query processing. Suppose that we know a quantum algorithm C_2 which finds a claw of two functions and we wish to obtain an algorithm C_3 which finds a claw of three functions f, g, and h. In the classical case, this extension is quite easy, i.e., we first find all claws of f and g, then we next search $h(x)$ such that $h(x)$ is equal to some of the previously obtained claws. In this talk, we try to apply this scheme to the quantum case. The question is how to prepare "the intermediate solutions", namely, all the claws of f and g as a quantum state. It turns out that if the size of the intermediate solutions is small, then we can exploit it to reduce the total time complexity.

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