A Study of Extending Transformation-based Synthesis to Incompletely-specified Functions

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***Abstract*—Given a completely-specified reversible function, existing transformation-based synthesis (TBS) methods find a reversible circuit that can then be mapped to a quantum circuit. This paper presents a preliminary study of extending the basic TBS method, and a variant of the method that uses Reed-Muller spectra, to integrate the assignment of don't-cares (DC) into the synthesis process, thus extending the TBS methods to handle incompletely-specified reversible functions. This approach is an alternative to assigning DC as a pre-synthesis step. The new methods facilitate the embedding of an irreversible function into a reversible specification thus allowing for the synthesis of a reversible circuit and subsequently a quantum circuit implementing the irreversible function.**

Experimental results are given that demonstrate the operation of the proposed methods as well as their limitations. A number of areas are identified for further research.

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