Quantum cellular automata for quantum information processing
ROBERT RAUSSENDORF, Caltech, YIYANG GONG, Caltech — In this talk I
discuss applications of simple quantum cellular automata in quantum information
processing. A two-dimensional lattice of qubits is considered that has engineered
defects (qubits missing) or a boundary of a suitable shape. The state of the system
is updated by an alternation of simultaneous conditional phase gates between all
pairs of next-neighboring qubits and simultaneous Hadamard transformations on all
qubits. The system is "programmed" by the choice of the boundary shape. The
following examples for applications are given: (1) transmission, (2) an encoding
circuit, (3) encoded transmission through an error-detecting channel i.e., encoding,
encoded transmission and decoding.

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