Computation with optical oscillator networks

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Abstract: We discuss future perspective of a new type of computing based on networks of optical oscillators, which includes coherent Ising machines for combinatorial optimization and coherent XY machine for continuous optimization.

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As saturation of the Moore's law becomes apparent, new computation methods based on physical systems are being studied intensively. Among such efforts, coherent Ising machine (CIM), which simulates the Ising model using a network of coherent optical oscillators, has been drawing attention [1-6]. Groups that include the author demonstrated that CIMs based on degenerate optical parametric oscillators (OPO) coupled by measurement-feedback could find solutions to complex combinatorial optimization problems [2,3]. Optical oscillator networks have also been employed for simulating XY Hamiltonian using coupled lasers [7] and non-degenerate OPO [8], which are expected to solve continuous optimization problems. In this talk, I will review these studies and describe a future perspective of computing with coupled optical oscillators.

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