

Preface

## Wandering on Surface

Everyone has experience wandering on the earth surface. We often take pleasure strolling in a city or at countryside, while a mountaineer enjoys his challenge of climbing to reach the peak. In recent years I have been fond of jogging, trekking and cycling. Last year I cycled from Chendu city, the capital of Sichuan province, to Lhasa city, the capital of Tibet, along the road G318 in order to experience a strong alternation of a gravitation potential field made of valleys at 2000-3000 m and peaks about 4000-5000 m. This tough journey of overcoming potential barriers makes me to reflect on the meaning of topology of surface.

Global optimization problem deals with a potential surface, which is mathematically constructed and usually has such a complex shape made of valleys and peaks, in a high dimensional parameter-space. Solving the problem aims to find the location of the global minimum potential, which corresponds to the ground state, on the surface. Simulated annealing as a kind of Markov chain Monte Carlo method enables one to search stochastically a shorter route for escaping from local potential valleys, climbing over potential peaks and reaching the final goal among infinite possible routes. Computer is thus the best tool to explore the potential surface for performing the most efficient random wandering. Recently, we have found the useful application of the method for deriving optical constants of a solid surface, as a new numerical technique in surface analysis.

But does such a solution of global optimization problem provide an idea to the global problems related to social, political, economic and environmental aspects? One common character of the global problems is that they are human involved other than the only pure nature involved for which science works. We human being has ability to construct imaginary potential in mind and seek its local minimum for the better life while the complexity of such potential surface comes from the dependence on numerous human- and nature-parameters. Nowadays we are peacefully living in a thermal equilibrium state corresponding to a rather high temperature and the balance is gained around the present local minimum. Annealing to low temperature by cooperation towards reaching the global minimum as the most stable state in this planet should create a totally different world for our life. By then wandering on this earth surface would be more joyful.

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