Monge Properties:
Contemporary Tools for Efficient Algorithms

Wolfgang W. Bein
University of Nevada, Las Vegas
Department of Computer Science

Abstract

Monge properties are simple monotonicity properties which are observed and used in various settings such as resource optimization, computational geometry, statistical sampling, computational biology and coding. These properties seem to occur naturally, and it was the eighteenth century French engineer Gaspard Monge who first wrote about them in "Mémoire sur la théorie des déblais et des remblais."

We are using the plural in "Monge properties" deliberately here, as researchers today study a variety of different Mongité properties: bottleneck, algebraic, higher-dimensional, joint-meet submodular on lattices, total monotonicity. Thus Monge properties are relevant in fundamental areas; there are surprising connections to series-parallel graphs, to convexity and quasi-convexity and to polymatroids.

We argue that Monge properties are a good tool for the design of efficient algorithms. In keeping with the theme of the workshop we will especially highlight recent contributions related to coding.