

From Fluids to Combinatorics and vice versa

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Abstract

We show some connections between combinatorial optimization and fluid mechanics. Our first example is the linear assignment problem which can be solved in $O(N^3)$ operations (as shown by Balinski thanks to a dual-primal algorithm). It can be seen as a discrete version of the Monge-Kantorovich problem in optimal transport theory which goes back to Monge 1780 and corresponds to pressure-less fluid motions. Our second example is the quadratic assignment problem which is NP and can be related to the more sophisticated model of incompressible fluid motions designed by Euler in 1757.