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Problems Section

An Open Global Optimization Problem on the Unit Sphere

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Consider the following problem:

$$\begin{aligned} \text{global max} \quad & \Phi_n(x) = \prod_{1 \le i < j \le n} ||x_i - x_j|| \\ \text{s.t.} \quad & ||x_i|| = 1, \ \ i = 1, \ldots, n \end{aligned} \tag{1}$$

and $x_i \in R^3$, for all $i = 1, \ldots, n$. The points $x_1, \ldots, x_n$ which give the global maximum of (1) are called the *elliptic Fekete points* (of order n). For applications and references see [1] and [2].

Problem (1) has many local maxima and saddle points. There is no known algorithm for computing an exact (or approximate) global maximum for the above problem.

References

1. Michael Shub and Steve Smale (1993), Complexity of Bezout's Theorem III. Condition Number and Packing, *J. of Complexity* **9**, 4–14.
2. M. Tsuji (1959), *Potential Theory in Modern Function Theory*, Maruzen Co., Tokyo.