1172-68-357 **Simina Branzei*** (`simina.branzei@gmail.com`), 375 Brown St, Apt 319, West Lafayeytte, IN 47906, and **Jiawei Li**, Beijing, Peoples Rep of China. *The query complexity of local search and Brouwer in rounds.* Preliminary report.

We study the problem of finding a local optimum and a Brouwer fixed point of a function in the black box model, where there is an upper bound k on the number of rounds of interaction with the function oracle. Rounds model distributed settings, where each query takes resources to complete and is executed on a separate processor.

We focus on the d-dimensional grid $[n]^d$, where the dimension d is a constant. For local search, when the number of rounds k is constant, the query complexity is $\Theta\left(n^{\frac{d^{k+1}-d^k}{d^k-1}}\right)$ for both deterministic and randomized algorithms. When the number of rounds is polynomial, i.e. $k = n^\alpha$ for $0 < \alpha < d/2$, the query complexity is at most $O\left(n^{(d-1)-\frac{d-2}{d}\alpha}\right)$ and at least $\widetilde{\Omega}\left(\max(n^{(d-1)-\alpha}, n^{\frac{d}{2}})\right)$ for randomized algorithms.

These bounds also imply a characterization of the query complexity of computing an ϵ-approximate Brouwer fixed-point in the d-dimensional unit cube $[0,1]^d$ in k rounds, where we find the query complexity is $\Theta\left((1/\epsilon)^{\frac{d^{k+1}-d^k}{d^k-1}}\right)$ for both deterministic and randomized algorithms. (Received September 01, 2021)