The Aggregate Homotopy Method For Unconstrained Sequential Min-Max Problem

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We consider the problem of minimizing a real-valued sequential max-min function $f(x) = \max_i \min_j \max_k \cdots \min_l \{f_{ijk\cdots l}(x)\}$. The problem arises in a variety of applications, such as design of electronic circuits, control system, etc. We give a first order necessity condition, the K-K-T system, for the sequential min-max problem. To solve the sequential min-max problem, we construct a hierarchical aggregate function and then, utilizing it, construct a homotopy. Under certain assumptions, we study properties of the hierarchical function, existence and limiting behavior of a smooth path defined by the homotopy. Numerically tracing the smooth homotopy path, we can find a solution of the K-K-T system of the sequential min-max problem.