

Convergence properties

Proposition

Assume that $f_i \in \mathcal{C}^2$, f_i strictly convex, $x^* \neq \pm\infty$, and *zero initial condition*. There is a positive $\bar{\varepsilon}$ s.t. if $\varepsilon < \bar{\varepsilon}$ then

$$\lim_{k \rightarrow +\infty} \mathbf{x}(k) = x^* \mathbf{1}, \text{ exponentially}$$

Sketch of the proof

- 1 transform the algorithm in a continuous-time system
- 2 recognize the existence of a two-time scales dynamical system
- 3 analyze separately fast and slow dynamics (standard singular perturbation model analysis approach)