Fixed Point Iterations

Banach-Picard	$x^{k+1} = T(x^k)$
Krasnosel'skiĭ-Mann	$x^{k+1} = x^k + \alpha_k \left[T(x^k) - x^k \right]$
Fast Krasnosel'skiĭ-Mann	$x^{k+1} = x^k + \frac{\alpha}{2(k+\alpha)} \left[T(x^k) - x^k \right] + \frac{k}{k+\alpha} \left[T(x^k) - T(x^{k-1}) \right]$
Heavy-ball	$x^{k+1} = T\left(x^k + \alpha_k \left[x^k - x^{k-1} \right] \right)$
Halpern	$x^{k+1} = \alpha_k u + (1 - \alpha_k) T(x^k)$
Viscosity Approximation	$x^{k+1} = \alpha_k f(x^k) + (1 - \alpha_k) T(x^k)$
Ishikawa	$\begin{cases} y^k = x^k + \beta_k \left[T(x^k) - x^k \right] \\ x^{k+1} = (1 - \alpha_k) x^k + \alpha_k T(y^k) \end{cases}$

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References

- Alvarez, Attouch. *An Inertial Proximal Method for Maximal Monotone Operators via Discretization of a Nonlinear Oscillator with Damping*. 2001.
- Boţ, Nguyen. *Fast Krasnosel'skiĭ-Mann algorithm with a convergence rate of the fixed point iteration of* $o(1/k)$. 2023.
- Halpern. *Fixed points of nonexpanding maps*. 1967.
- Ishikawa. *Fixed points by a new iteration method*. 1974.
- Lieder. *On the convergence rate of the Halpern-iteration*. 2020.
- Mann. *Mean value methods in iteration*. 1953.
- Moudafi. *Viscosity Approximation Methods for Fixed-Points Problems*. 2000.
- Xu. *Viscosity approximation methods for nonexpansive mappings*. 2004.