Recursive adaptation of stepsize parameter for non-stationary environments.

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Summary: In this article, we propose a method to adapt stepsize parameters used in reinforcement learning for non-stationary environments. When the environment is non-stationary, the learning agent must adapt learning parameters like stepsize to the changes of environment through continuous learning. We show several theorems on higher-order derivatives of exponential moving average, which is a base schema of major reinforcement learning methods, using stepsize parameters. We also derive a systematic mechanism to calculate these derivatives in a recursive manner. Based on it, we construct a precise and flexible adaptation method for the stepsize parameter in order to maximize a certain criterion. The proposed method is also validated by several experimental results.

doi:10.1007/978-3-642-11161-7_38