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Mamba SSM with Kalman Filtering in Pendulum RL environment

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State-space models (SSMs) have emerged as a compelling alternative to Transformer architectures, delivering comparable performance at significantly lower computational cost. Although deterministic SSMs such as Mamba have achieved state-of-the-art results in areas like sequence modelling and image segmentation, their deterministic nature limits their suitability for probabilistic reinforcement learning (RL) environments, where uncertainty is intrinsic.
This paper introduces an architecture that integrates the Mamba SSM with the Kalman filter, enabling it to learn and adapt to uncertain environment dynamics. We validate the effectiveness of this approach on a modified Pendulum task from the Gymnasium RL library, demonstrating its potential for learning and representing complex dynamics in probabilistic settings.

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