A Stable Actor-Critic Algorithm for Solving Robotic Tasks with Multiple Constraints

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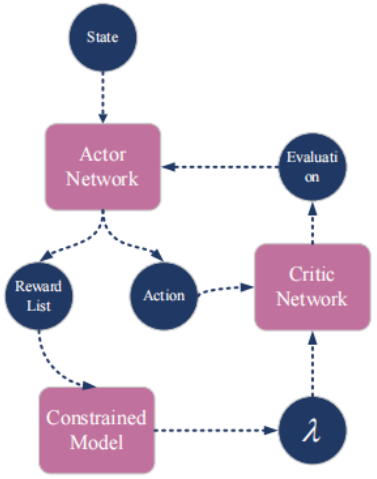
Problems & Ideas

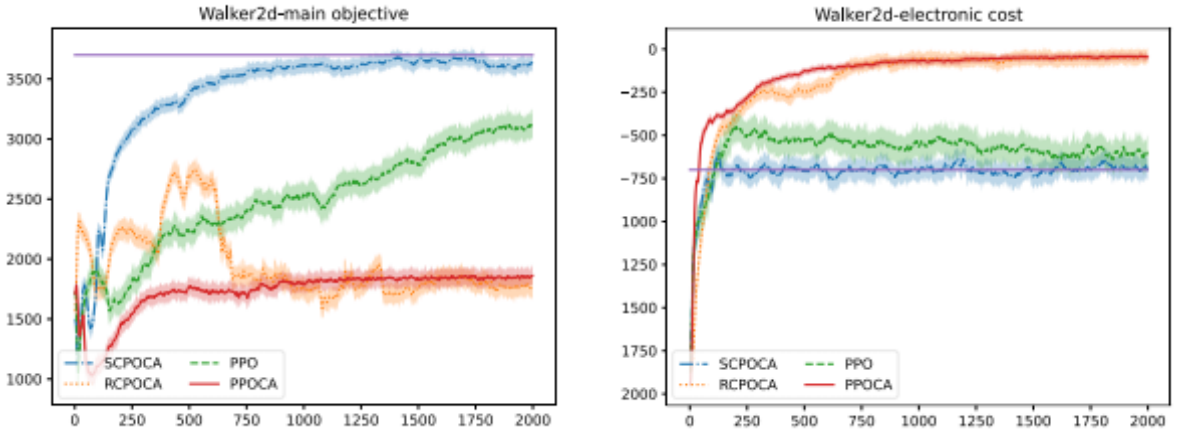
- Problems of former approaches:
  - Most reinforcement learning algorithms only cares about one object.
  - Former constrained reinforcement learning algorithms involves only one constraint.
  - When there are multiple constraints, they are often controversal.
- Ideas: Combine the Actor-Critic framework and CMDP to solve robotic tasks which often involve multiple constraints.



The structure of our method, where the constrained model is inserted into the Actor-Critic model to achieve constrained learning. Furthermore, the constrained parameter λ reflects the trad-off between the constraints and the main object.

Main Contributions

- Contributions:
  - This study introduces SCPOCA that learns an optimal policy satisfying more than one constraint, considers both the learning efficiency and stability.
  - The model reduces the number of constraints by analyzing the relations among the performance sequences of different constraints and aggregating those that behave similarly.
  - To achieve a stable learning, the model constantly adjust the update and learning rates in response to the status of the learning process.



The main results show that our method nearly satisfies the given constraint and fufill the main task.