Gaussian Processes for Dynamic Movement Primitives with Application in Knowledge-based Cooperation

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Abstract:
Dynamic Movement Primitives (DMPs) represent stable goal-directed or periodic movements, which are learned from observations or demonstrations. They rely on proper function approximators, which are sufficiently flexible to represent arbitrary movements but also ensure goal convergence in point to point motions. This work shows that Gaussian Processes (GPs) are suitable as a regressor for learning movements with DMPs ensuring stability. In addition, GPs provide a measure for the uncertainty about the current movement, which we exploit by proposing a new cooperation scheme for DMPs: For better reproduction of demonstrations, we follow the intuition, that individuals with more knowledge lead towards the goal, while others follow and focus on cooperation. Along with simulation results, we validate the presented methods in a robotic cooperative object manipulation task.

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