Dynamic Movement Primitives

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Problem addressed

- Exploring knowledge-base representation frameworks for DMPs which allow :
  - Representation of DMP's weights, initial condition, goal and scaling parameters.
  - Representation of information related to functionality of DMPs.
  - Correct combination of DMPs to generate desired trajectory.
- Combining simple dynamic motion primitives for accomplishing a complex task using knowledge-base representation framework.

Relevance of the problem addressed

- Dynamic motion primitives can be used in mobile robots for robust navigation.
- But learning entire motion as a single primitive reduces re-usability of that motion.
- A mobile robot can be benefited from this work as it can use DMP framework for navigation by combining simple motion primitives to navigate along a complex path.

Advantages of Dynamic Motion Primitves

- DMP learns trajectories in terms of attractor landscape of non-linear autonomous differential equations.
- Convergence of dynamic motion primitive is guaranteed [7].
- Any arbitrary motion trajectory can be learned.
- Trajectories can be scaled in space as well as in time [7, 3].
- These learned motion primitives can be initialized anywhere in the attractor space [7, 3].

Advantages of Dynamic Motion Primitves

- On-line modifications in trajectory are possible [7].
- Obstacles can be avoided robustly [6].
- Re-planning is not needed unless an event causing major disturbance in the environment occurs [6].

Related Work

- Schaal et. al[7] and Ijspeert et. al[2, 3] provide concrete theory and experimental results proving advantages of using DMPs.
- Park et. al[6] proposed method for obstacle avoiding using DMPs and potential fields.
- Lioutikov et. al , Nemec et. al , Park et.al have demonstrated motion sequencing by various methods. [4, 5, 6]
- Software package implementing DMP framework is available in Robot Operating System.

Deficits

- All the work done so far provide concrete base to implement DMP for robots.
- But it doesn't solve the problem of obtaining correct combination of simple motion primitives in order to do a particular task.

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