Abstract

With the advent of robotics technology, complex and intelligent behaviors for humanoid robots become relatively feasible and more applicable in recent years. The fast momentum in the chip technology and sensors for robotics hardware brings its own problems along with its merits. The complexity introduced in the new hardware requires more sophisticated learning algorithms to cope with complicated behavioral tasks.

Evolutionary robotics is one promising solution to the behavior acquisition problem for humanoid robots. This paper describes and analyzes a series of experiments to develop a general evolutionary behavior acquisition technique for humanoid robots which eliminates the human cost for fully designing and architecting solutions for each separate behavior. In addition, the proposed method presents a novel messy problem representation to minimize the risks involved in the current existing evolutionary algorithms with location dependent genotype representations. Based on this approach, the robot's behavior is defined by joint trajectories evolved concurrently. Each joint trajectory consists of a series of primitive actions defined by a chromosome. By using genetic algorithms with specifically designed genetic operators and messy representations, complex behaviors are evolved from the primitive actions defined by the user. Representations are specifically tailored to be useful in trajectory generation for humanoid robots. The effectiveness of the method is demonstrated by two experiments implemented both in simulation and real time environment. Finally, performance of the proposed method is comparatively demonstrated with well-known benchmarking algorithms.

1. 修了年月日： 2007 年 3 月 22 日
2. 専攻名 ： 基盤情報学専攻
3. 氏名 ： アイデミール デニズ
4. 学生証番号： 56342
5. 論文題目 ： Evolutionary Behavior Acquisition for Humanoid Robots using Messy Representations
6. キーワード ： evolutionary robotics, messy representations, behavior acquisition
7. 指導教員氏名： 伊庭斉志
8. 指導教員役職：(教授/助教授) 教授