STUDY OF BEHAVIORAL EVOLUTION BY SIMULATING VIRTUAL AGENT USING EVOLUTIONARY ALGORITHM: EVOLVING JUMPING BEHAVIOR

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Abstract

This thesis concerns with evolving jumping behavior of a biped virtual agent. Evolutionary Algorithm (EA) is used to evolve the agent. It is expected that the agent can perform can evolve to perform well on the task. The process of achieving good jumping behavior shows how EA works on evolving the agent. In addition, this thesis also proves that by using EA, good jumping behavior could actually emerge which will be difficult if it is designed manually.

The agent is provided minimal capability to perform vertical jump, using the principle of Hooke’s Law on spring. Then, the agent is tested to jump over obstacles with various height settings. The height of the obstacles can be fixed or random. The controller for the agent is Artificial Neural Network (ANN) which takes environment sensors value from the agent and provide output as the action that should be taken by the agent. The performance of the agent is assessed by assigning scores. If the agent performs well, the scores will be high; otherwise, it will be low. The score will be used by EA to optimize the weight setting of ANN and in turn, optimize the agent itself. The performance is evaluated by plotting the scores to the graph. From the results obtained, it is observed that the agent performs well on fixed height obstacles, shown by quite stable graph movement; while the agent performs poorly on random height obstacles, shown by oscillating graph movement.

After the experiments are performed, the results show that good jumping behavior could actually achieved by using EA. On the graph, EA performs well on the fixed height obstacle setting since it is more predictable. On the other hand, EA does not perform well on random height obstacle setting since the factor of randomness confuses the EA.

Keywords
Virtual Agent, Artificial Neural Network, Evolutionary Algorithm, Jumping Behavior
PREFACE

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