

# **Pareto Ensembles for evolutionary Synthesis of Neurocontrollers in a 2D Maze-based video game**

## **Abstract**

In this paper, we present a study of evolving artificial neural network controllers for autonomously playing maze-based video game. A system using multi-objective evolutionary algorithm is developed, which is called as Pareto Archived Evolution Strategy Neural Network(PAESNet), with the attempt to find a set of Pareto optimal solutions by simultaneously optimizing two conflicting objectives. The experiments are designed to address two research aims investigating: (1) evolving weights (including biases) of the connections between the neurons and structure of the network through multi-objective evolutionary algorithm in order to reduce its runtime operation and complexity, (2) improving the generalization ability of the networks by using neural network ensemble model. A comparative analysis between the single network model as the baseline system and the model built based on the neural ensemble are presented. The evidence from this study suggests that Pareto multi-objective paradigm and neural network ensembles can be effective for creating and controlling the behaviors of video game characters.