Optimizing robot behaviour in the maze by GA

Abstract:
Mobile robots as universal technical system, which can provide mechanical activity, are one of the modern trends of the scientific researches in the field of robotics. Most often solved task by robot is the fast and safe orientation in the labyrinth (maze). The main problems, which appeared during mobile robot navigation in the maze, are the detection of the walls, corners and fast navigation to the destiny without any collisions. There are lots of ways to solve the task. Usually the wall fallowing or behavioral based techniques are involved in the robot control.

The most common approach used today, to develop controllers for autonomous robots, is to employ a Genetic Algorithm (GA) to evolve an artificial Neural Network (NN). The GA is very time consuming search technique and mostly is done in simulation in conjunctions with online evaluation.

GA uses the Darwinian idea of natural selection and genetic recombination, where the individuals most often are represented as a gene-structure. The GA is used to find possible solutions over many generations to solve the problem. Usually problem reduces to minimization certain criterion. In our case we require the robot to perform fast and safe navigation in the maze.

In this work the Khepera (K-Team product) together with KIKS simulator are used to demonstrate the NN capability in robot behavioral navigation optimized by GA.