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ARTIFICIAL ANT COLONY METHOD FOR STATE-SPACE EXPLORATION

S. Vechet[*], J. Krejsa[**], J. Hrbacek[+]

Abstract: *Finding a way through an unexplored environment belongs to actual problems in many artificial agent systems. Common algorithms as state-space searching or rapidly exploring random trees are used when the map of given environment is known. In this paper we present a simulation experiments with multi agent system which is represented as artificial ant colony.*

Keywords: ***artificial ant colony, path planning, state space exploration.***

1. Introduction

Finding a way through an unexplored environment belongs to actual problems in many artificial agent systems. Common algorithms as state-space searching or rapidly exploring random trees are used when the map of given environment is known. In many real-world applications the agent is faced to problem find path in partially mapped or unknown environment (Krejsa,2011). Simple algorithms for finding path in unknown environment are based on so called *Bug algorithms*, which are computationally fast, but in some cases are not possible to avoid complex obstacles.

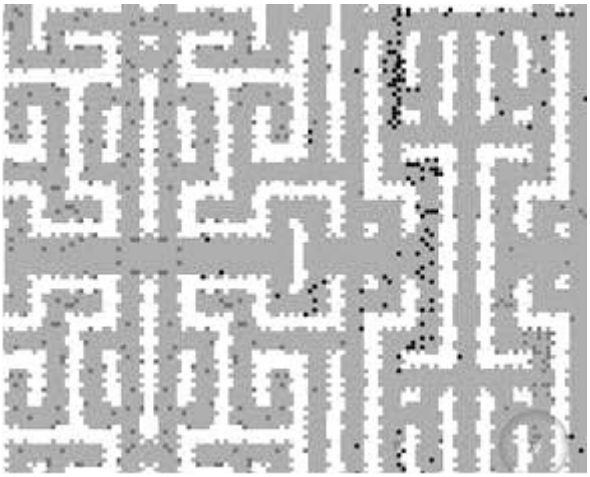

Fig. 1. Simulation framework

Presented algorithm of artificial ant colony (see figure 1) is used to finding a path through an unexplored environment. The main issue is to explore the biggest space in shortest time. Each ant is represented as simple agent with its own searching strategy. As each agent is a part of the ant colony, this local strategy can be very simple, but the exploring efficiency of the whole colony can be huge (Krejsa,Ondrousek,2011). Each agent has local information only, about near environment based on visible range of agents sensors.

[*+] Ing. Stanislav Vechet, Ph.D., Ing. Jan Hrbacek: Brno University of Technology, Faculty of Mechanical Engineering, Faculty of Mechanical Engineering, Brno University of Technology, Technicka 2896/2, Brno, Czech Rep, e-mail: vechet.s@fme.vutbr.cz, yhrbac03@stud.fme.vutbr.cz

[**] Ing. Jiří Krejsa, PhD.: Institute of Thermomechanics ASCR, v.i.i, Brno department, Technická 2, 616 69, Brno, CZ, email: krejsa@fme.vutbr. cz

2. Simulation results

This chapter presents the simulation results from performed experiments. We have prepared a number of simulations with two artificial ant colonies for direct comparison and also some experiments with more, usually six, ant colonies (see figure 2). Each ant colony has different strategy for path searching. As the main criterion for the classification of the efficiency of the method, the number of ants in one colony was used. The exploration strategy is based on efficient algorithm for path planning and also on effective food searching policy. Thus, the final number of ants in one colony, after the maximal number of simulation steps, was used as the main criterion for the classification.

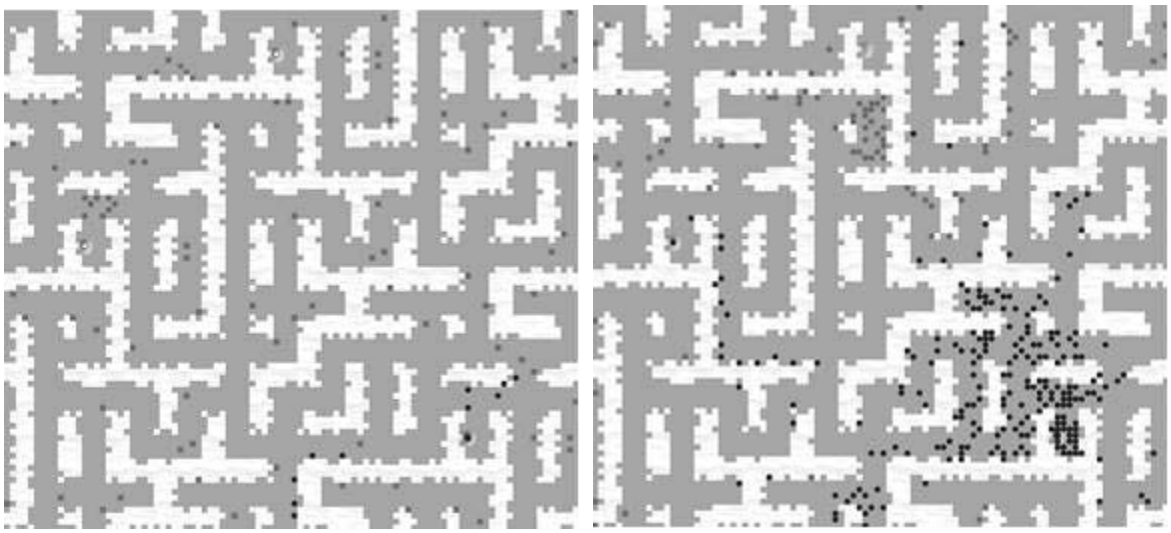

Fig. 2. Ant colony evolution during searching

3. Summary

Methods for finding path through unknown environment via artificial ant colony algorithms were presented in this paper. In simulation experiments were successfully tested two main approaches to artificial ant colony behavior: searching and exploration. The searching method is very easily implemented and is computationally fast, on the other hand the exploration method is more complicated for implementation, more time consuming but very efficient.

4. Acknowledgement

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