Pursuit and Evasion

Bachelor Thesis

by

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Abstract

Abstract in ENGLISH

Sammanfattning

Abstract på SVENSKA

Contents

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Chapter 1

Introduction

Giving a general overview of the report.

1.1 Organization Of the Report

- Chapter 2 explains the simulation environment we built.
- Chapter 3 contains a description of the algorithms we decided to use.
- Chapter 4 contains the results of our simulations.
- Chapter 5 contains a discussion of our results, comparison and conclusions.

1.2 Background

The objective of this section is to give a short theoretical background of optimization. Also a general description of the Pursuit and Evasion problem.

1.2.1 What is optimization

What is optimization?
What is an optimal solution?
Non-optimal solutions?
Good solutions and computational time?

1.2.2 (the need for) a near optimal solution

Giving a very short background for the following section.

1.2.3 P & NP problems

explain what P and NP-hard problems is, and what consequenses it yields.

1.2.4 Heuristic methods

Explanation of what heuristic methods is, and how one sacrifices optimality for gain in computational time.

Chapter 2

Problem formulation

The essentials of our problem formulation today is "To test implementation of greedy approach, tabu search and genetic programming and evaluation." The exact formulation is in progress...

2.1 Problem with the problem

the headline is self explanatory, the ide her is to discuss the P vs NP aspekt. maybe this will be incorporated with another part of the introduction

2.2 Approach

A description of our approach to the problem. Describing the overview of our approach. Mentioning the creation of an testing enviroment, choice and application of heuristics and target data to evaluate the effectiveness.

Chapter 3

Simulation Environment

In order to attain the data needed for a comparison of our different algorithms it was nessecary to construct a good testing enviroment. We decided to create this enviroment by the use of two separate parts. One part is called the "Map generator". This part creates a map of the enviroment, test the feasibility and prints feasible enviroments into an output file. The other part is called the "Network generator". This part reads in an enviroment from a file, creates a graph network to the corresponding map and gives each node in the network its relevant information.

assumptions made: we do not lose generality by only constructing convex enviroments. this is in line with the assumtions made in the paper boolean control (referens till artikel)

3.1 Map generator

-we demand that each map is connected.
we demand that each region is convex
the model can easily be expanded to non square regions for further work.
mention distribution of the function rand(), and how it distridutes the obstacles.
describe indata/outdata
pseudo kring hur programmet kors The environment generator has length, width and number of obstacles as input. By construction each subarea is convex. The generator also tests for the total area to be connected, which guarantees a feasible environment.
Every environment created can be considered to be built of squares. This results in that diagonal edges will not be created, but since a diagonal can be created by a line of obstacles if the resolution is high enough, that should not be a loss of generality.

3.2 Node network

The node network generator has a matrix that represents the environment as input. The matrix can either be generated by the simulation environment generator, se previous section, or written by hand.

A node network will be generated from the input matrix. Each element in the input matrix is represented by a node, which is given the attributes Vision, move and state. Vision is an array of all the nodes that can be seen from the current node, move is an array with the neighbour nodes to the current node.

Pseudo-code:
* Read environment matrix from file
* Create a node-matrix B, and give each node a default state
* Calculate and set move and vision attributes for each node

Chapter 4

Methods

A Description of the methods and algorithms we have used.

4.1 Greedy

Greedy

4.1.1 Description

A description of what Greedy is

4.1.2 Algorithm

A description of the algorithm

4.1.3 Implementation

A description of how the algorithm is implemented

4.1.4 Development process

How the development of the algorithm have proceeded.

4.2 Tabu

Tabu

4.2.1 Description

A description of what Tabu is

4.2.2 Algorithm

A description of the algorithm

4.2.3 Implementation

A description of how the algorithm is implemented

4.2.4 Development process

How the development of the algorithm have proceeded.

4.3 Genetic

4.3.1 Description

Genetic algorithms is based on the idea of evolution. Using a combination of reproduction, mutation and survival of the fittest a solution is generated.

4.3.2 Algorithm

A description of the algorithm

4.3.3 Implementation

A description of how the algorithm is implemented

4.3.4 Development process

How the development of the algorithm have proceeded.

Chapter 5

Results

Statistics, tables and a description of the tables. Also why we have chosen these tables etc.

Results for MILP evaluation could also be added here.

Chapter 6

Discusion

This chapter contains analysis of each algorithm, why it did or did not work, how it compares to the other algorithms and a conclusion. The main purpose is to present conclusions from the data presented in the previous chapter.

6.1 Analysis

An analysis of each algorithm, evaluation of why it did or did not work.

6.2 Comparsion and statistics

A comparsion between the algorithms, and perhaps also with MILP.

Chapter 7

Conclusion

A conclusion of our work, and future work.

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