## Planning report

## Writer

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## Temporary title

Implementation and testing of a fpt algorithm for computing the h^+ heuristic

## Problem definition

### Introduktion

Heuristic function are used in automated planning and scheduling to estimate the distance from a state to a goal.

A planning task could be a driver who starts in the city A(initial state) and wants to drive to city B and then go to city C. For some unknown reason, the driver wants to go in that specifik order and is not satisfised to visit city C before city B(unless he goes to B after visiting C).

In figure 1, the roads the driver can use is the graph edges and the vertexes are the cities the roads leds to. The driver wants to cross as less cities as possible.

If a computer search for a path in a graph that leds to a goal when the graph’s vertexes does not has estimated value, a search function like breeth-first must be used to find a path such a path. Since there can be exponetial number of states with respect to the number of vertexes, a solution will take expontial time in the worst case.

Instead of searching for a goal blindly, a heuristic function can take a graph as an input and return the graph with a number on each vertes. Each value is as estimaton how far the vertex/state is from a solutuon.

In figur 2, we can see that each vertes has an estimate value. There are two vertex that has the value 0, which means that they are both a goal to the problem. If a graph has the the value infinity, it means that the state is a dead end and no solution can be found from that state.

When a computer search for a goal on a graph that is the output from a heruistic function, the next node in the path will be the node that can be reached from the current node with the lowest estimated value. Backtring is applied if the search path leds to a dead end.

In figure 2, the path from the initial state from the goal state is: XXXXXX

In this thesis will Christers heurstic algorithm(hereby known as christers algorithm) [1] be implemented and compared with other heuristic algoritgms to see if it is competitive in practise or not.

Christers algorithm runs in polinomial time with respect to the input size n but exponential with respect to the number of path k in the graph.

### Expected result

….whaat….

### Problem

Bäckström [1] describe an ftp-algorithm for computing the heuristic [3] in a DGT graph. This algorithm can be used in the special case when a graph is acyclic (exceptions are loops). Since delete relaxing [4] problem is an NP-problem, it is very important to find as fast algorithms as possible.

In this thesis, we will implement and run Christens algorithm in the planner “Fast Downward” and compare how “good” the algorithm performance is with other heuristic’s in the planner.

How “good” the algorithm performance is depends on two things, the running time and how many nodes its visiting. The motivation to not only measure its running time is because that depends on how good the algorithm is implemented.

## Approach

See the submited file skiss\_1.pdf

## Literature

[1] will be used to learn about the planning system that will be used to test the algorthm. Source [2] dewcribe an algoritm how to descuta tree in polynomial time. This is needed for implement the main algoritm

[3] is a source to the main algoritm.

1. Bäckström C. Parameterising the Complexity of Planning by the Number of Paths in the Domain-transition Graphs. Proc 21st Eur Conf Artif Intell(ECAI-14),  … [Internet]. 2014 [cited 2015 Apr 7]; Available from: http://www.ida.liu.se/~chrba/Papers/ecai14.pdf

2. Russell S, Norvig P, Intelligence A. A modern approach. Artif Intell Prentice-Hall,  … [Internet]. 1995 [cited 2015 Apr 7]; Available from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.259.8854&rep=rep1&type=pdf5