

CSCI 4800/5800 – Expert Systems / Heuristic Programming
Spring 2016 – Dr. Williams
Programming Assignment 2 – State Space Search
Due March 7, 2016

CSCI 4800 – Farmer, Fox, Goose, and Grain Problem

See [Fox, goose and bag of beans puzzle](#) in Wikipedia.

Once upon a time a farmer went to a market and purchased a fox, a goose, and a bag of grain. On his way home, the farmer came to the bank of a river and rented a boat. But in crossing the river by boat, the farmer could carry only himself and a single one of his purchases - the fox, the goose, or the bag of grain.

If left together, the fox would eat the goose, or the goose would eat the grain.

The farmer's challenge was to carry himself and his purchases to the far bank of the river, leaving each purchase intact. How did he do it?

Use the graph search program provided in class to build a state space solution to the problem. Is there a difference in the solution for a breadth-first versus depth-first traversal of the graph? What is the difference in the number of node generated and explored?

Note that is similar to the Missionaries and Cannibals Problem.

CSCI 5800 – Mountain Goats Problem

Three black mountain goats one direction on a narrow mountain ledge and encounter three white mountain goats going in the opposite direction. They stop with the space of a goat between the two lead animals. Mountain goats cannot (for the purposes of the puzzle) move backwards, but they are good jumpers. A mountain goat can either move forward into an empty space, jump over one mountain goat to an empty space, or jump over two mountain goats to an empty space. How can they all continue on their way?

We can abstract this to the following:

B B B _ W W W

Where each B represents a black mountain goat, each W represents a white mountain goat, and _ represents a blank space. Each B may move right into an adjacent _, jump over an intervening B or W into an _, or jump over two intervening B or W into an _. Each W may similarly move left the same way. The goal is to get all of the Bs to the right of all of the Ws.

Use the graph search program provided in class to build a state space solution to the problem. Is there a difference in the solution for a breadth-first versus depth-first traversal of the graph? What is the difference in the number of node generated and explored?

Extend your representation to handle any number of black and white goats – they don't have to be the same number. Is the problem solvable for all such combinations?