

COMP3620 – Search Tutorial

1. From *Russell and Norvig Exercise 3.7, Page 90*

Give the state representation, initial state, goal state and the successor function for each of the following. Choose a formulation that is precise enough to be implemented.

- a) You have to colour a map of the World using only four colours, in such a way that no two adjacent countries have the same colour.
- b) A 3-foot tall monkey is in a room where some bananas are suspended from the 8-foot ceiling. He would like to get the bananas. The room contains two 3-foot-high crates (A and B), which the monkey can stack move and climb.
- c) You have a program that outputs the message “Illegal input record” when fed a certain file of input records. You know that processing of each record is independent of the other records. You want to discover what record is illegal.
- d) You have three jugs, measuring 12 litres, 8 litres and 3 litres, and a water tap. You can fill the jugs up or empty them out from one to another or onto the ground. You need to measure exactly 1 litre.

2. From *Russell and Norvig Exercise 4.1, Page 134*

Trace the operation of A^* search applied to the problem of getting to Bucharest from Lugoj using the straight-line distance heuristic. That is, show the sequence of nodes that the algorithm will consider and the f , g , and h score for each node.

3. *Blame Phil*

In the *Jobshop scheduling problem* we have n jobs, each of which has m parts. Part j of job i takes processing time t_{ij} on machine j . (That is, part j can only be done on machine j). For all jobs, part j must be completed before part $j + 1$ (precedence constraints), and once we start part j we must complete it (no pre-emption). We want to find a schedule that minimizes “makespan” – the time the last job is complete.

- a) Describe an admissible heuristic for the job-shop problem.
- b) Thinking about a local search approach, define one or more neighbourhoods for the problem.

