IDA - Tutorial

During the lecture, we have seen the tree-based search and how it can be applied to different problems. In this tutorial, we give you the opportunity to try out how these techniques work. The exercises in this tutorial are to be solved using pen and paper.

Exercise 1

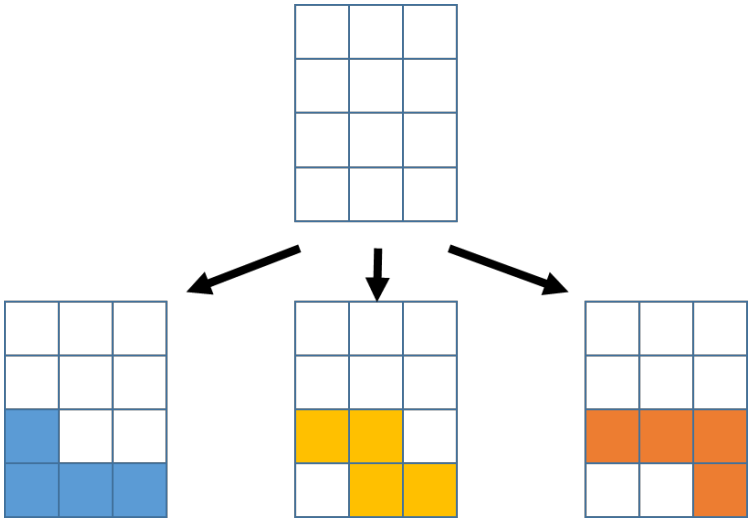
A delivery company has 3 fragile packages to deliver. The packages must be kept upright (no rotations/reflections allowed). They want to fit all three packages in a standard packing box which is three units across, four units high. They have an agent to help with determining the best order for packing. The agent assumes gravity, so each package will be placed at the lowest point possible in the packing box.

Figure 1. The standard packing box space and three packages

a) Show the full search tree that this agent will generate when exploring the packing order for these packages.
b) Would you recommend that this agent implements breadth first or depth first search and why? Consider two situations;
   (i) Where the agent simulates packing the parcels.
   (ii) Where the agent actually places the parcels in the packing box during the search process.
c) A new set of packages have arrived. Explain how the branching factor of the search tree for these packages will differ from your original tree and why.

Figure 2. A new set of packages

Hint for sub-question a:



Exercise 2

A treasure hunter wants to get to a treasure located in a temple. The hunter has a map showing all the possible passages together with a probability of successfully crossing the passage (Figure 3)

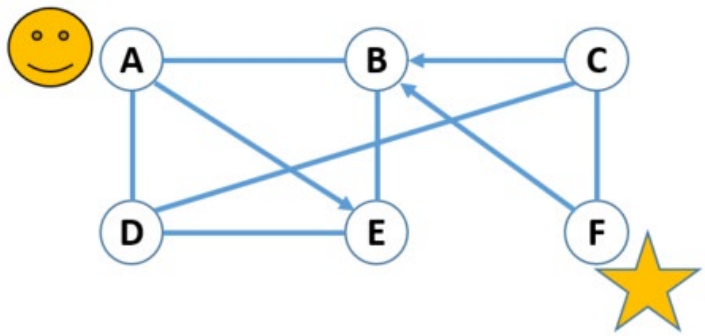


Figure 3. Treasure map

P(A↔B)=0.9
P(A→D)=0.3
P(A→E)=0.9
P(B←C)=0.5
P(B↔E)=0.6
P(C↔D)=0.7
P(C↔F)=1
P(D↔E)=0.8

Help the treasure hunter find a safest path to the treasure. We can assume that probabilities of successfully crossing the path are independent, i.e., the probability of successfully crossing the path A→B→C can be calculated as P(A→B→C)=P(A→B)*P(B→C). Please notice that some of the passages are one-way only, indicated by the arrow.

Exercise 3

Consider the following mini-max game tree, shown in Figure 4. What is the best score that player max can achieve? Which branches can be pruned?

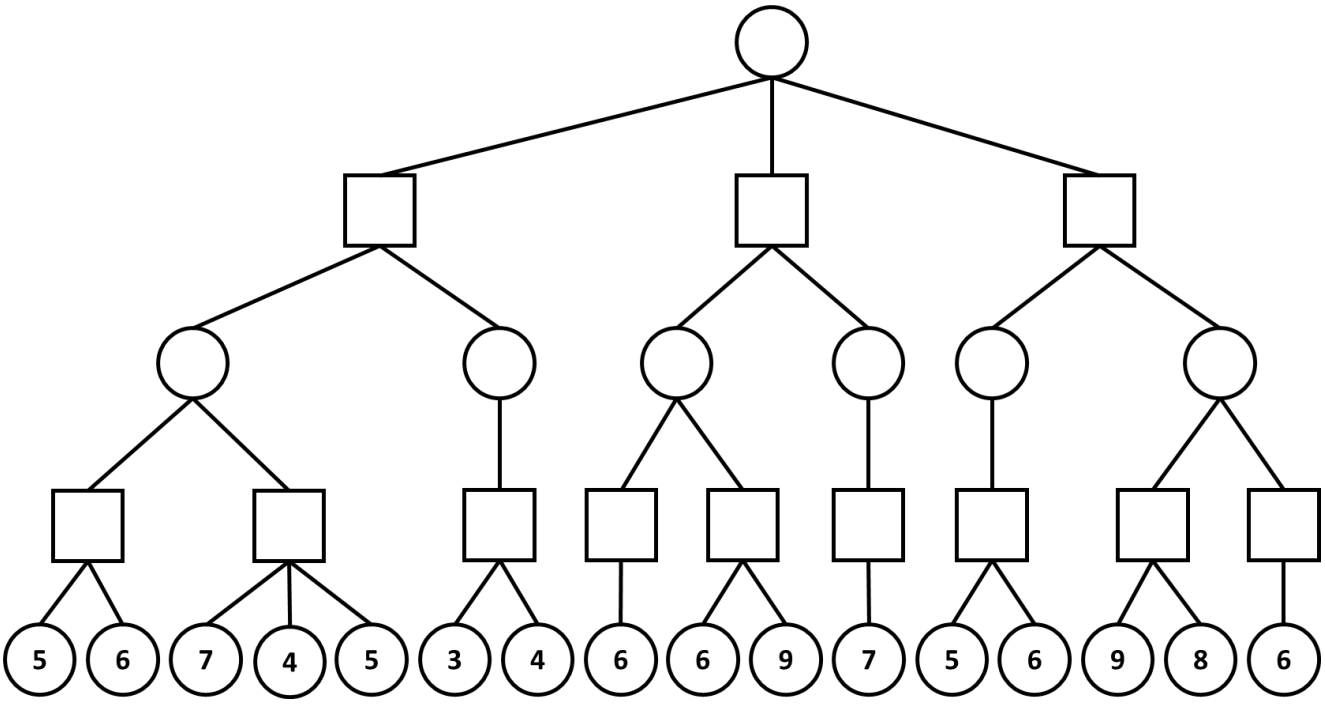


Figure 4. Minimax tree game.