

Maximum Carrots Collection By Rabbit

Optimization Problem

Problem Description

Figure 1 illustrates a grid of 3-by-3 where each cell (square) contains a number of carrots. For example, in the Start cell there is one carrot and in the End cell there are 5 carrots. The rabbit shown below aims to start a journey from Start cell toward End cell and to collect the maximum number of carrots. The rabbit can only move in Right direction or Top direction as shown by the arrows below. Thus, the ultimate objective of this problem is to find the best path in the grid that results in the collection of the maximum number of carrots.

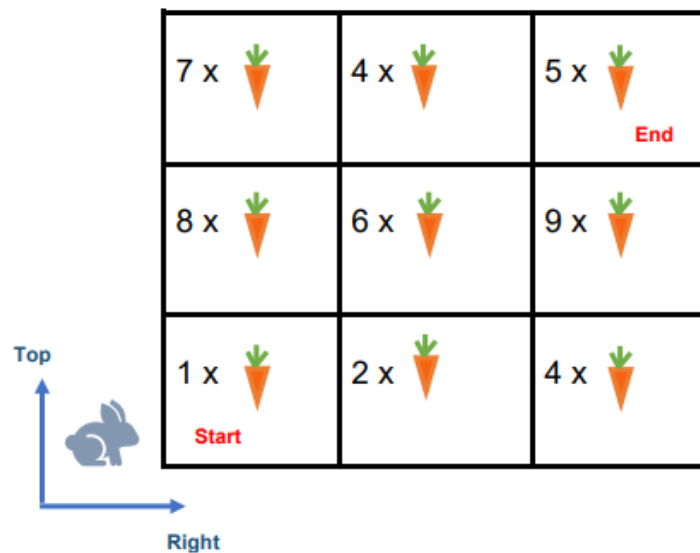


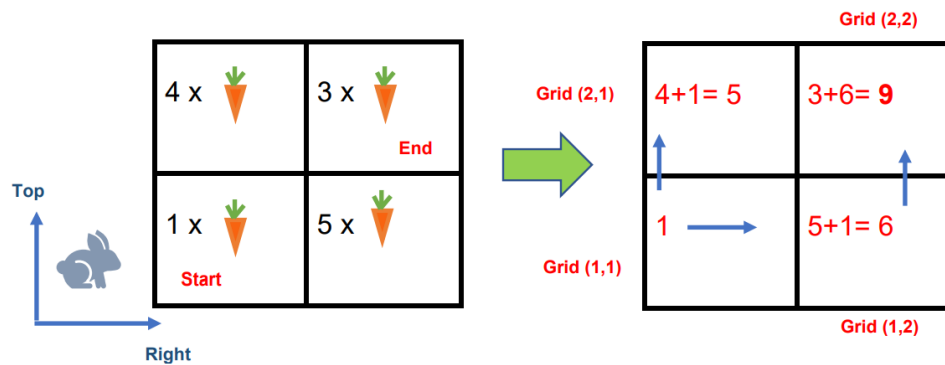
Figure 1. Graphical representation of the problem of finding the best path results in the maximum number of carrots.

Hints For Solving the Problem

There are different approaches for solving this problem. One approach is to consider the following rules for finding the best path and finally maximum number of carrots:

- In the Start cell, the maximum number of carrots is the number of carrots indicated.
- The maximum number of carrots for other cells is equal to the summation of the number carrots on that cell with the maximum number of carrots on the adjacent cells.

For example, for the following 2-by-2 grid, we have:



Thus, the maximum number of collected carrot is 9 and the best path is:

Grid (1,1), Grid (1,2), Grid (2,2)

MATLAB Coding

For the problem given in Section 1, write a MATLAB program that returns the best path taken by the rabbit from starting point to the end point and the maximum number of carrots collected by the rabbit. Your MATLAB program should at least contain one function file and one script calling the function file to produce the result on the Command Window. The script should receive the information of the grid and then call the function file to solve it. The output on the Command Window should be like this:

The best path is: Grid (1,1), Grid (xx ,xx), ..., Grid(3,3)

The maximum number of carrots collected is: xx

Important Note: Your MATLAB program should be comprehensive and can be applied on any N-by- M grid. It means that if you feed a new grid (with different number of carrots in each cell compared to the above grid) to your MATLAB program, it should be able to solve it. You should show this verification as well.