School of Computer Science, University of Windsor

60-141: Introduction to Algorithms and Programming II
Term: Summer 2014 (July-August)
Instructor: Dr. Asish Mukhopadhyay

Assignment 1
Posted: 3rd July, 2014
Due: 12 July, 2014, 11:59pm

Preamble: For lab 1, you solved Problem 4 recursively only. This assignment explores how it can be solved iteratively.

Grading Scheme: The first part of the problem carries 4 points; the second 6 points for a total of 10. Mail your solution to parti@uwindsor.ca before the due date. The submission should have your name and student ID on it.

Credits: The idea of this assignment is original and mine.

Problem For given values of the non-negative integers m and n compute $A(m, n)$ iteratively given that:

$$A(m, n) = A(m, n-1) + A(m-1, n),\ m, n \geq 0 \tag{1}$$

$$A(m, n) = m - n \text{ if } m < 0 \text{ or } n < 0 \tag{2}$$

A straightforward way of doing this is to fill a 2-dimensional array of size $(m+1) \times (n+1)$ in row major order or column major order (see Fig. 1). The last entry filled in is $A(m, n)$. Thus we need array space of size $O(mn)$, that is roughly quadratic. Implement this algorithm in C.

The more challenging part of this assignment is to devise an algorithm to do this this using only a 1-dmensional array of size $\min\{m, n\} + 1$ only. Implement a C program for such an algorithm.

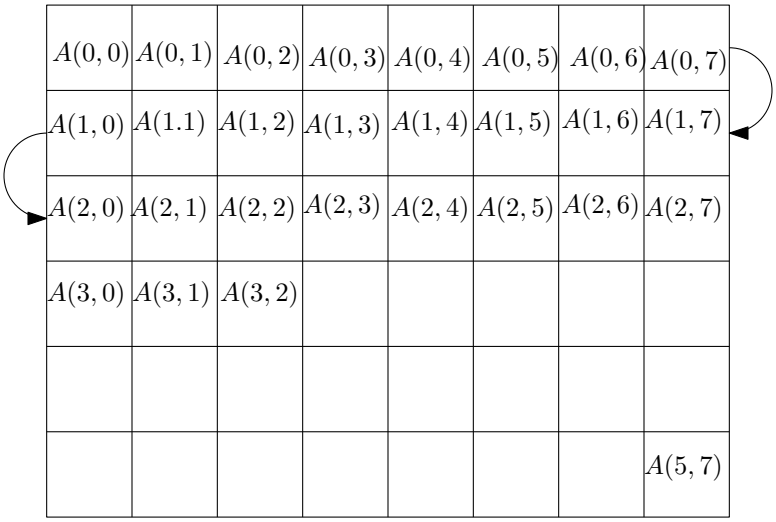

Figure 1: *Matrix filled in row-major order to compute A(5,7)*