CS303E: Elements of Computers and Programming Lists of Lists

Mike Scott
Department of Computer Science
University of Texas at Austin

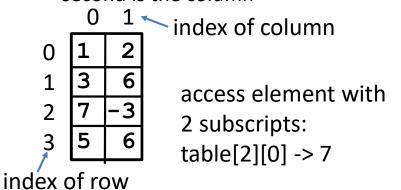
Last updated: May 30, 2024

Creating list of lists

Can create list of lists in Python

table = [[1, 2], [3, 6], [7,-3], [5, 6]]

- Access an element with 2 subscripts.
- By convention first subscript is row and the second is the column



CS303E Slideset 7: 2

List of Lists

Creating list of lists

Can also use list comprehension

table2 = [[0] * 12] * 10 A list of lists with 10 rows and 12 columns per row.

flips = [['H' if random.random() <= 0.5 else 'T' for x in range(12)] for x in range(10)]

A table with 10 rows and 12 columns per row. Each elements is a random coin flip.

List of Lists Problems

Write a function that returns the index of the row of a list of lists of ints has the largest sum. In the case of a tie return the index closest to 0.

Write a function that returns the index of the **column** of a list of lists of ints has the largest sum. In the case of a tie return the index closest to 0.

303E Slideset 7: 3 List of Lists CS303E Slideset 7: 4 List of Lists

Example of using a list of lists

Conway's Game of Life

- a cellular automaton designed by John Conway, a mathematician
- not really a game
- a simulation
- takes place on a 2d grid
- each element of the grid is occupied or empty by a simple organism, but not any known organism

Simulation

http://www.cuug.ab.ca/dewara/life/life.html

- Select pattern from menu
- Select region in large area with mouse by pressing the control key and left click at the same time
- Select the paste button

CS303E Slideset 7: 5

List of Lists

CS303E Slideset /

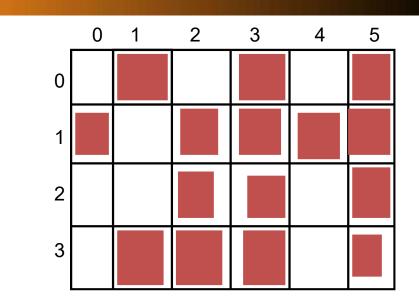
Liet of Liet

Generation 0

	0	1	2	3	4	5
0	•	*	•	*	•	*
1	*		*	*	*	*
2			*	*		*
3		*	*	*		*

* indicates occupied, . indicates empty

Or



CS303E Slideset 7: 7

List of List

CS303E Slideset 7: 8

List of Lists

Generation 1

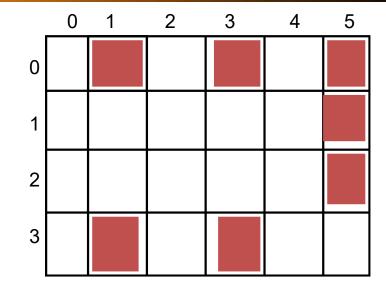
	0	1	2	3	4	5
0	•	*		*		*
1	•		•		•	*
2	•	٠				*
3		*		*		

* indicates occupied, . indicates empty

CS303E Slideset 7: 9

List of Lists

Or , Generation 1



CS303E Slideset 7: 10

List of Lists

Rules of the "Game"

If a cell is occupied in this generation.

- it survives if it has 2 or 3 neighbors in this generation
- it dies if it has 0 or 1 neighbors in this generation
- it dies if it has 4 or more neighbors in this generation

If a cell is unoccupied in this generation.

there is a birth if it has exactly 3 neighboring cells that are occupied in this generation

Neighboring cells are up, down, left, right, and diagonal. In general a cell has 8 neighboring cells

Case study

Design and implement a complete Python program to automate Conway's Game of Life

- text based
- user input for size of world
- wrapped or bounded?
- border or not?
 - high level design first, then implement solution
- test, test, test, test

