UC Berkeley EECS
Lecturer
Michael Ball

Abstract Data Types & Dictionaries

Announcements

- Fill out the midterm alternates & accommodations from **by Friday**
  - https://edstem.org/us/courses/8883/discussion/654595
  - **Midterm, Tues 7-9pm**
  - **Remote exams are proctored via Zoom (camera + screen recording)**
- **Cheat Sheet Policy:**
  - **Unlimited Handwritten cheat sheets, but no outside resources.**
  - **We'll give you a Python reference sheet in a couple weeks too.**
- **Maps out tomorrow. Partners encouraged, but not required.**
- Q&A Thread for Today:
  - https://edstem.org/us/courses/8883/discussion/661546

Computing In The News

11-Foot-Tall 3D Printer Is Helping Create a Community

The New York Times Debra Kamin September 28, 2021

Builders are constructing homes in a village on the outskirts of Nacajuca, Mexico, using an 11-foot-tall three-dimensional (3D) printer. San Francisco-based nonprofit New Story, Austin, TX-based construction technology firm Icon, and Mexican social housing production company Échale partnered on the project. Controlled by a tablet or smartphone, Icon's Vulcan II printer pours lavacrete, a proprietary concrete compound, into swirled layers; it can complete a single residence in less than 24 hours. The homes have already withstood a magnitude 7.4 earthquake. New Story's Alexandria Lafci said, "We're really looking at the biggest opportunities to have both impact and efficiency gains. There is a very significant gain in speed that you get with 3D printing, without sacrificing quality."

Today's Lecture

- Abstract Data Types
  - Practice with Tic-Tac-Toe, Fall 2020 Midterm
  - Phone Book Example
- Other questions?
  -

Example: Tic Tac Toe and Phone Book

- See the companion notebook.
- Download the file "ipynb"
  - Go to datahub.berkeley.edu
  - Log in, then select "Upload"

Tic Tac Toe

Midterm Q4 Spring 2020

Read the question

Look at what's being asked

Read the provided code

Check the doctests

"Sketch" a solution

Double check it aligns with the requirements

Write your solution

4. (10 points) I'm Just a Student, Sitting in Front of a Computer, Asking it to Solve My Game

We've gotten bored of playing Tic-Tac-Toe with our friends, so we've decided it's time to write a program to ensure we always win! So far, we've built some handy functions, and now it's your turn to complete our program.

Given the functions below, complete the function named `determine_win`, which returns whether or not the given player won the Tic-Tac-Toe game. In the Tic-Tac-Toe game, a player can win if their marker, $'X'$ or $'O'$ makes a straight line horizontally, vertically, or diagonally.

We have provided three functions, which you can assume are correct: `all_four_equal`, `column`, and `diagonal`. For full credit, your solution must make use of each of these functions. (Part of this question is to spend time reading and understanding these functions before moving on to your own solution. As long as you use these three, there's many valid solutions.)

```
def all_four_equal(pieces, player):
    """
    Returns true if the set of 3 pieces is the same as the player.
    >>> all_four_equal(['X', 'X', 'X'], 'O')
    False
    """
    return pieces[0] == pieces[1] == pieces[2] == player

def column(board, index):
    """
    Return the 0th, 1st, or 2nd column in a board.
    >>> column([['X', 'O', 'X'],
                ['O', 'X', 'X'],
                ['O', 'X', 'O']], 1)
    ['O', 'X', 'X']
    """
    return [ row[index] for row in board ]

def diagonal(board, index):
    """
    Return either 0th or 1st diagonal in a board.
    >>> diagonal([['X', 'O', 'X'],
                  ['O', 'X', 'X'],
                  ['O', 'X', 'O']], 1)
    ['X', 'X', 'O']
    """
    if index == 0:
        return [ board[0][0], board[1][1], board[2][2] ]
```