Week 6: Boggle!

Practice? Cheat?

Super-human boggle player

Boggle solver for ...

Recursion ... depth-first search

Modules

(and a first glance at classes)

Google

recursion

Search

About 8,210,000 results (0.15 seconds)

Everything

Images

Maps

Videos

News

Did you mean: ***recursion***

Recursion - Wikipedia, the free encyclopedia

en.wikipedia.org/wiki/**Recursion** +1

Recursion is the process of repeating items in a self-similar way. For instance, when the surfaces of two mirrors are exactly parallel with each other the nested ...

Formal definitions of recursion - Recursion in language - Recursion in mathematics

Seems like we're missing a base case here ... and the progress case doesn't seem to be making the problem smaller.


Boggle


THAT
NONEXIST

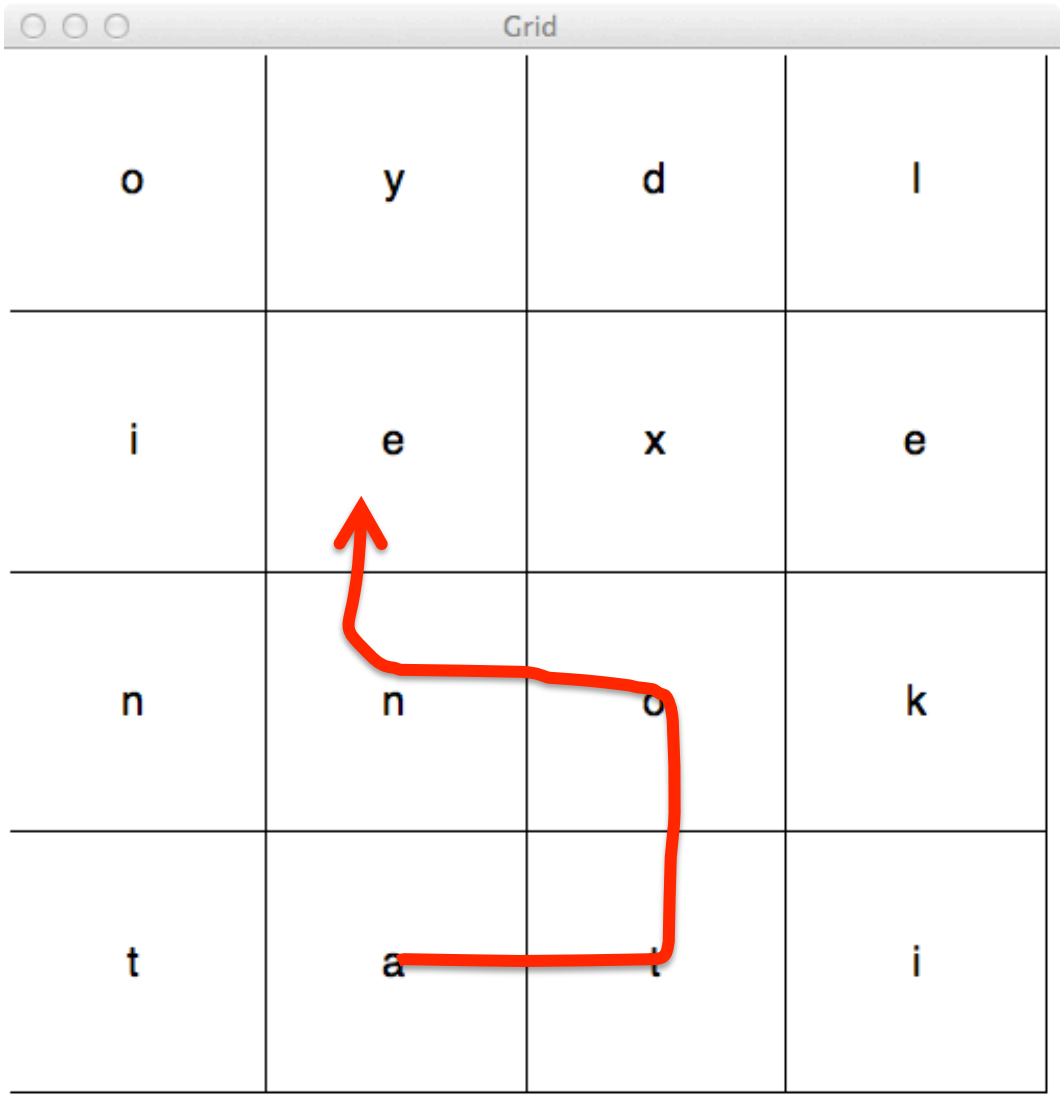
Grid

o	y	d	l
i	e	x	e
n	n	o	k
t	a	t	i

```
$ python3 boggler.py "oydliexennoktati" dict.txt
anent
annex
ant
anti
atone
den
dent
dye
eon
ikon
inane
inn
into
ion
iota
kit
led
leonine
nation
neon
nine
not
oat
one
oxen
tan
tanned
tat
tike
toe
toed
toke
ton
tone
yen
yin
Press enter to end
```

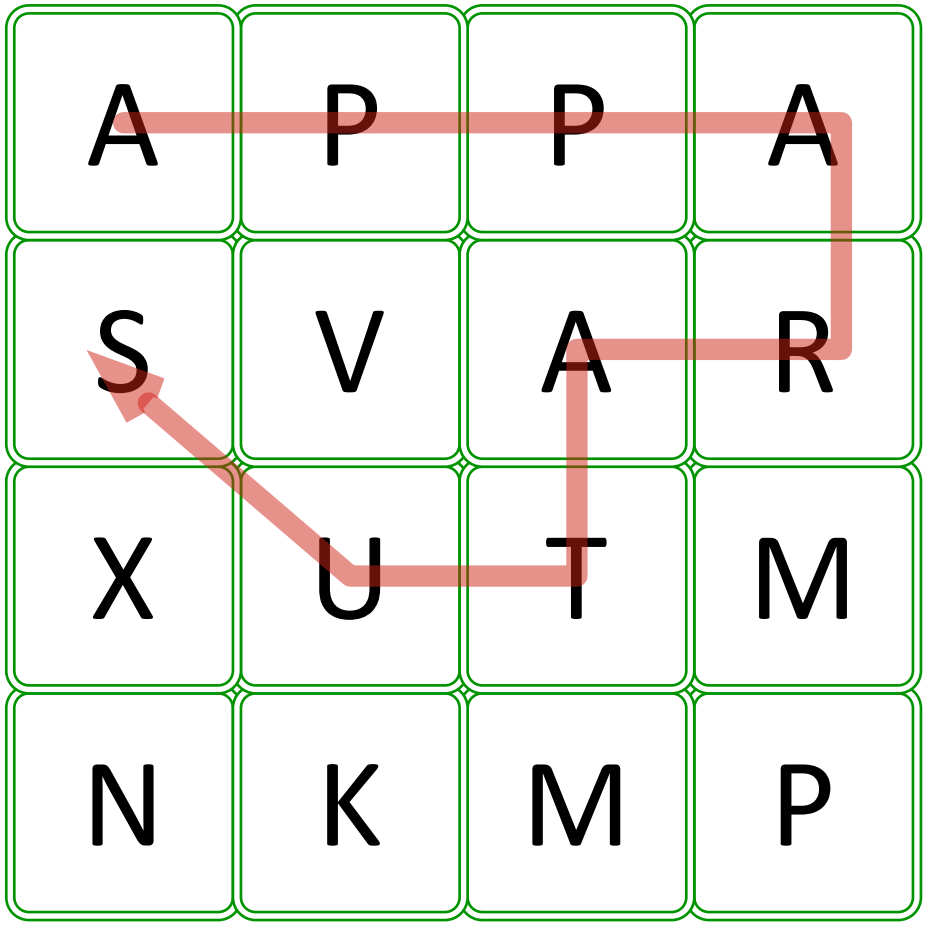
Grid

o	y	d	l
i	e	x	e
n	n	o	k
t	a	t	i


Grid
o y d l
i e x e
n n o k
t a t i

Let's see it

A	P	P	A
S	V	A	R
X	U	T	M
N	K	M	P

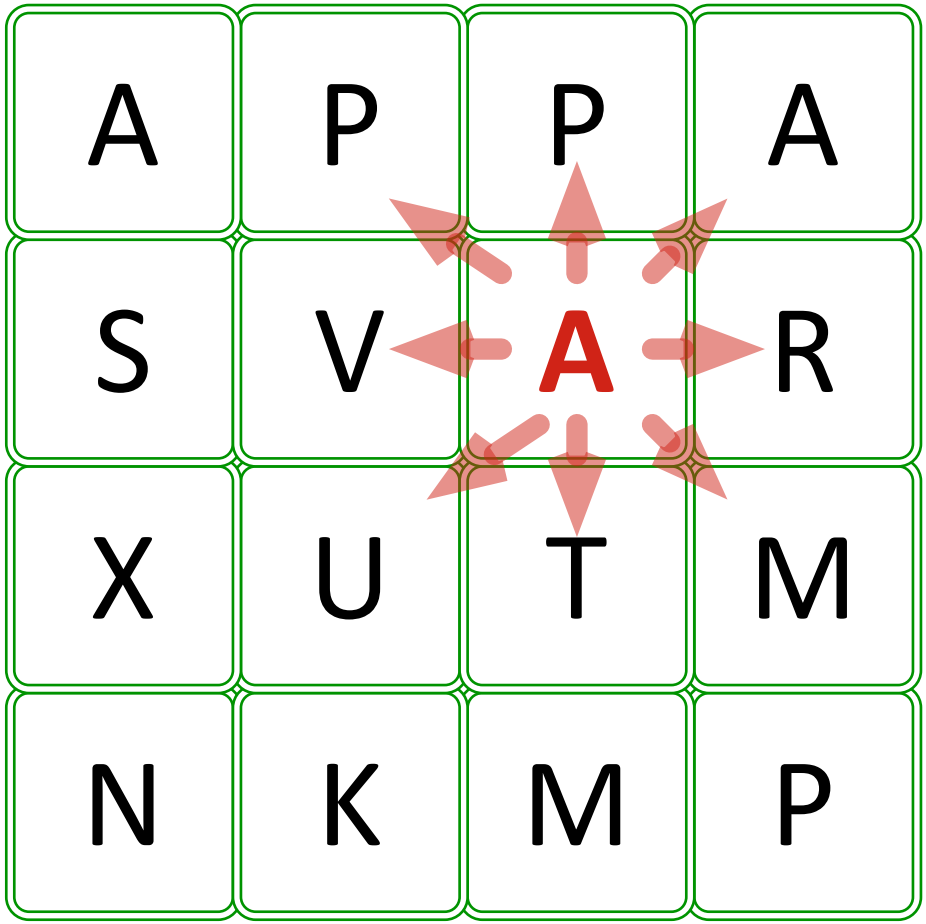

A P P A
S V A R
X U T M
N K M P

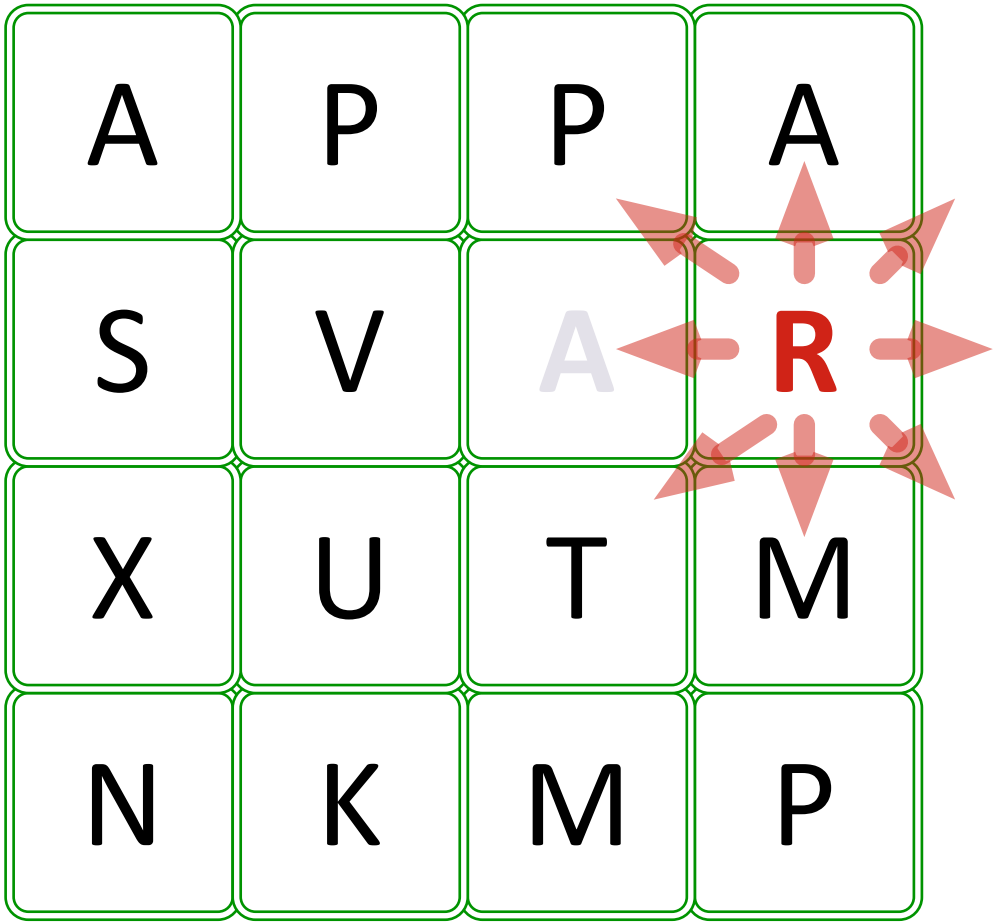
Let’s look at a simpler example ...

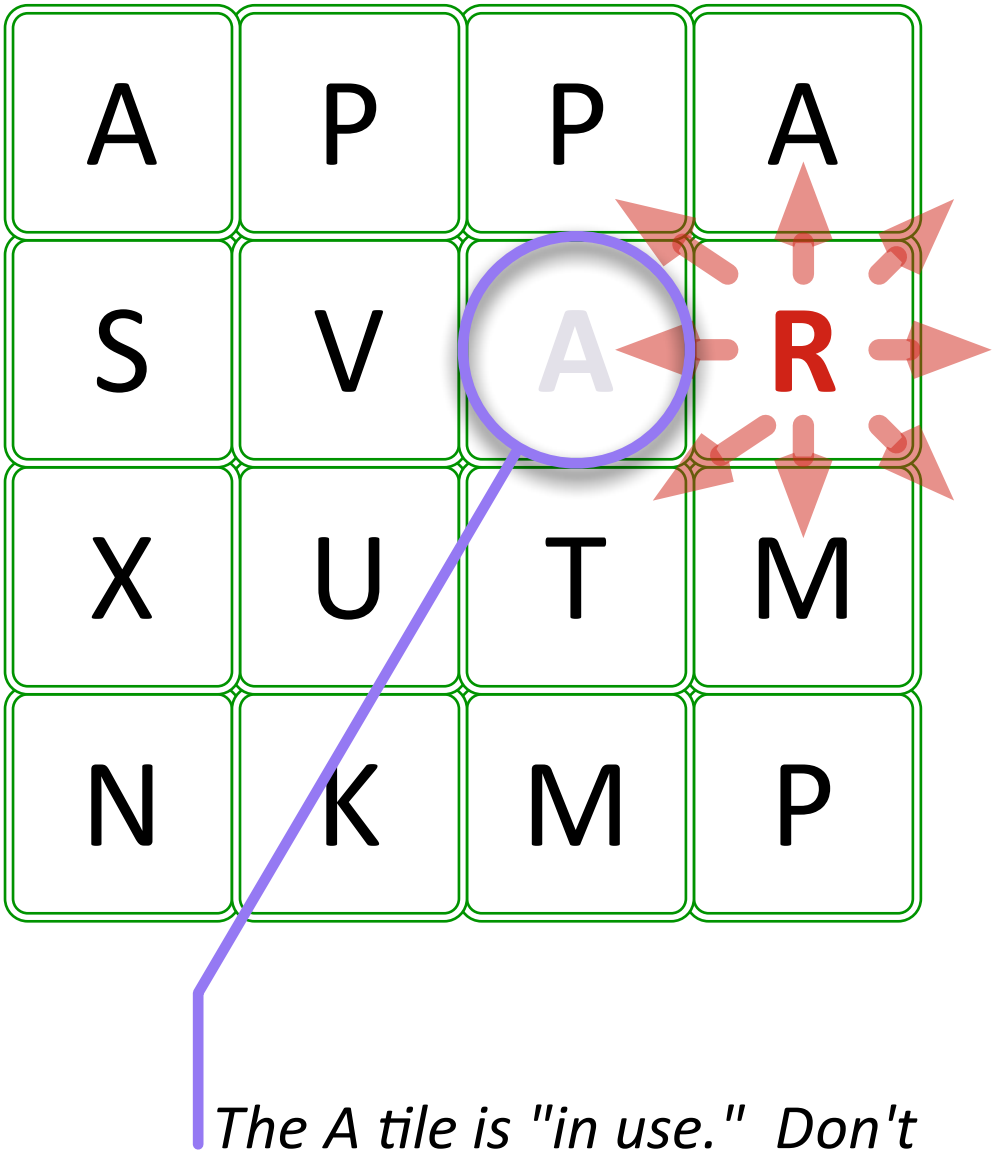
A	P	P	A
S	V	A	R
X	U	T	M
N	K	M	P

A	P	P	A
S	V	A	R
X	U	T	M
N	K	M	P

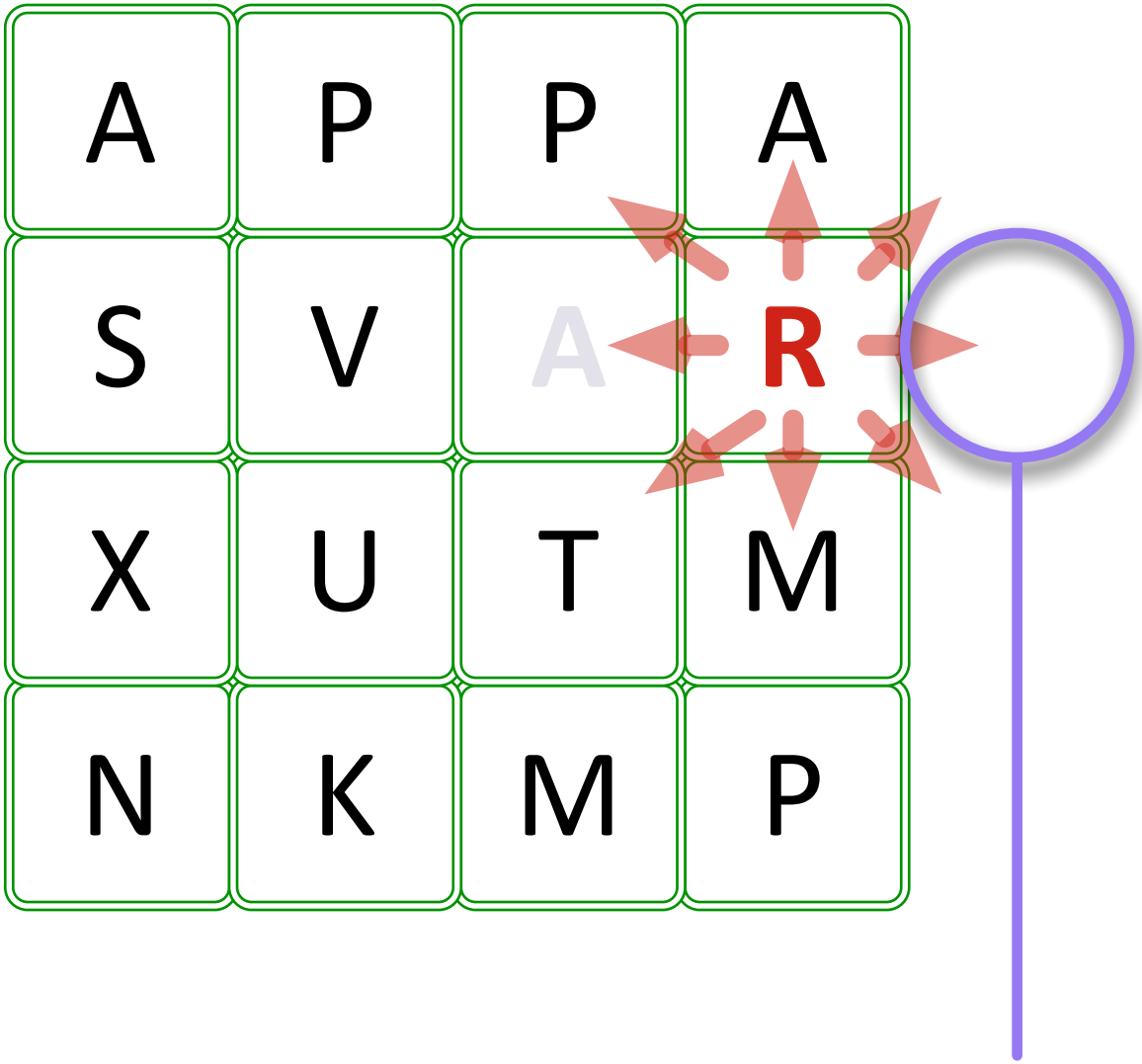
We can explore all 8 directions ...




A P P A
S V A R
X U T M
N K M P



The A tile is "in use." Don't use it again in the same word.



Column 4 is off the board.
Don't go there.

Depth-first search logic

Given a position and a prefix ...

- If the position is off the board, do nothing
- If the position is already in use, do nothing
- New prefix = prefix + tile
- If it's a complete word, note it
- If it's a valid prefix
  - Mark current tile as "in use"
  - Recursively search in all 8 directions
  - Unmark current tile before returning

```
$ python3 boggler.py
"oydliexennoktati" dict.txt
yen
yen
yin
yin
dye
den
dent
dent
den
dent
led
leonine
inn
inane
inane
inn
into
eon
eon
nine
neon
nation
not
nine
oxen
oxen
one
oat
oat
kit
tan
tanned
tat
tan
tanned
anent
annex
ant
ant
anti
atone
ant
annex
anent
anent
toke
ton
tone
toe
toed
toe
toed
tike
tan
tanned
tat
tan
tanned
ikon
iota
ion
Press enter to end
```

Remove duplicates ... how?

Two ways

1) Python “set” data structure
2) Sort, scan

```
$ python3 boggler.py "oydliexennoktati" dict.txt
anent
annex
ant
anti
atone
den
dent
dye
eon
ikon
inane
inn
into
ion
iota
kit
led
leonine
nation
neon
nine
not
oat
one
oxen
tan
tanned
tat
tike
toe
toed
toke
ton
tone
yen
yin
Press enter to end
```

Modules

boggler.py

```
"""
Boggle solver.
  Usage:  python3 boggler.py  "board" dict.txt
  where "board" is 16 characters of board, in left-to-right reading order
  and dict.txt can be any file containing a list of words in alphabetical order

  Author: Michal Young, michal@cs.uoregon.edu  2012.10.26

"""
from boggle_board import BoggleBoard

import game_dict  # Dictionary of legal game words
import sys     #for command line arguments: board, dictionary
```

Have a look ... coming soon to a project near you

In addition to boggler.py, you write game_dict.py

game_dict.py

```
dict = [ ]

# Codes for result of search
WORD = 1
PREFIX = 2
NO_MATCH = 0

def read( filename, min_length=3 ):
    ...
def search( str ):
    ...
```

dict.search(str):

```
"""
Search for a prefix string in the dictionary.
 Args:
    str:  A string to look for in the dictionary
 Returns:
     code WORD if str exactly matches a word in the dictionary,
            PREFIX if str does not match a word exactly but is a prefix
                  of a word in the dictionary, or
           NO_MATCH if str is not a prefix of any word
                  in the dictionary
 """
```

(You can use a binary search or a linear search)

in boggler.py

```
...
match = game_dict.search(prefix)
if match == game_dict.NO_MATCH:
    return
 ...
```

Summary: Boggle solver

Depth first search, again

Break into modules

Dictionary (game_dict.py)

class BoggleBoard (boggle_board.py)

(which uses grid.py for display,

which uses graphics.py for display)

Solver (boggler.py)

(main program uses dictionary

and board)

This one is done for you, but have a look ... we'll be building more **class**es soon.