

YEAH!

Boggle

Brendon Go / 10.20.2015

Adapted from SL Rishi Bedi's Slides

What is Boggle?

Demo

What are all these files?

- bogglemain.cpp
- boggleui.h
- boggleui.cpp

What are all these files?

- boggleplay.cpp
- boggle.h
- boggle.cpp

Breakdown of Assignment

- Setup
- Human Turn
- Human Word Search
- Computer Turn
- Multiple Plays and GUI

Part 1: Setup

- Draw Board
 - User Input
 - Example on white board
 - Random? -> Shake the cubes
 - How are the cubes represented
 - How will you represent the game board
 - Assign to random location
 - Pick Random Side of Cube to be face up
 - Example on Whiteboard
 - Possible reuse of a method in both cases

AAEEGN	ABBJO0	ACHOPS	AFFKPS	AOOTTW	CIMOTU	DEILRX	DELRYV
DISTTY	EEGHNW	EEINSU	EHRTVW	EIOSST	ELRTTY	HIMNQU	HLNNRZ

Useful Code:

```
#include "shuffle.h"
    shuffle(array, length);
```

```
#include "random.h"
    randomInteger(0, 6);
```

```
#include <cctype>
    isalpha(ch);
```

```
#include "simpio.h"
    getYesOrNo("Do you want to eat cake? ");
```

Part 2: Human Turn

- Ask User for Input
 - Check that it's a valid word
 - ≥ 4 letters long
 - In the dictionary
 - Check that it can be formed in the board
 - If it can be found:

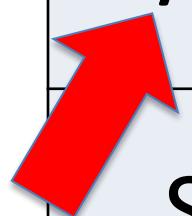
Part 3: Human Word Search

- How to do humanWordSearch: Recursive Backtracking
 - Choose, Explore, Unchoose
 - Find where the word can start
 - From each starting point, recursively try to extend to find the word (helper function!!)
 - High Level Example: SL Rishi Bedi Slides

humanWordSearch Demo

word = “smart”

A	T	R	E
S	N	A	R
U	M	B	D
D	A	N	E



humanWordSearch Demo

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A	T	R	E
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humanWordSearch Demo

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humanWordSearch Demo

word = “smart”

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S	N	A	R
U	M	B	D
D	A	N	E

- We found the first letter
 - Mark it as used
 - Why?
 - Explore the rest of the word

humanWordSearch Demo

word = “mart”

A	T	R	E
S	N	A	R
U	M	B	D
D	A	N	E

- We found the first letter
 - Mark it as used
 - Why?
 - Highlight square
 - Look at its neighbors for the second letter.

humanWordSearch Demo

word = “mart”

A	T	R	E
Marked As Used	N	A	R
U	M	B	D
D	A	N	E

- We found the first letter
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 - Why?
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 - Look at its neighbors for the second letter.

humanWordSearch Demo

word = “mart”

A	T	R	E
Marked As Used	N	A	R
U	M	B	D
D	A	N	E

- We found the first letter
 - Mark it as used
 - Why?
 - Highlight square
 - Look at its neighbors for the second letter.
- **Found it,
now do it
again.**

humanWordSearch Demo

word = “art”

A	T	R	E
Marked As Used	N	A	R
U	Marked As Used	B	D
D	A	N	E

- We found the first letter
 - Mark it as used
 - Why?
 - Highlight square
 - Look at its neighbors for the second letter.

humanWordSearch Demo

word = “art”

A	T	R	E
Marked As Used	N	A	R
U	Marked As Used	B	D
D	A	N	E

- We found the first letter
 - Mark it as used
 - Why?
 - Highlight square
 - Look at its neighbors for the next letter.

humanWordSearch Demo

word = “art”

A	T	R	E
Marked As Used	N	A	R
U	Marked As Used	B	D
D	A	N	E

- We found the first letter
 - Mark it as used
 - Why?
 - Highlight square
 - Look at its neighbors for the next letter.
- **Found the next letter!**
Let's do it again.

humanWordSearch Demo

word = "rt"

A	T	R	E
Marked As Used	N	Marked As Used	R
U	Marked As Used	B	D
D	A	N	E

- We found the first letter
 - Mark it as used
 - Why?
 - Highlight square
 - Look at its neighbors for the next letter.

humanWordSearch Demo

...a few steps later

A	T	R	E
S	N	A	R
U	M	B	D
D	A	N	E

- How do we know when we are here?
 - That's our base case
- *What if that first "S" did not work out?*
 - Keep looking

Part 4: Computer Turn

- Run an exhaustive recursive search to find all possible words on the board.
- Similar to human words search
 - Choose, Explore, Unchoose
 - But don't combine. Why?
- Differences in:
 - Highlighting
 - Finds All words
 - Stopping Condition is different
 - You don't stop when you find a word.
 - eg. DESK then DESKS

computerWordSearch () Demo

word so far: “E”

E	A	Q	E
S	R	A	R
U	V	K	H
M	E	J	O

Select each neighbor in turn
and recurse down.

computerWordSearch () Demo

word so far: “EA”

	A	Q	E
S	R	A	R
U	V	K	H
M	E	J	O

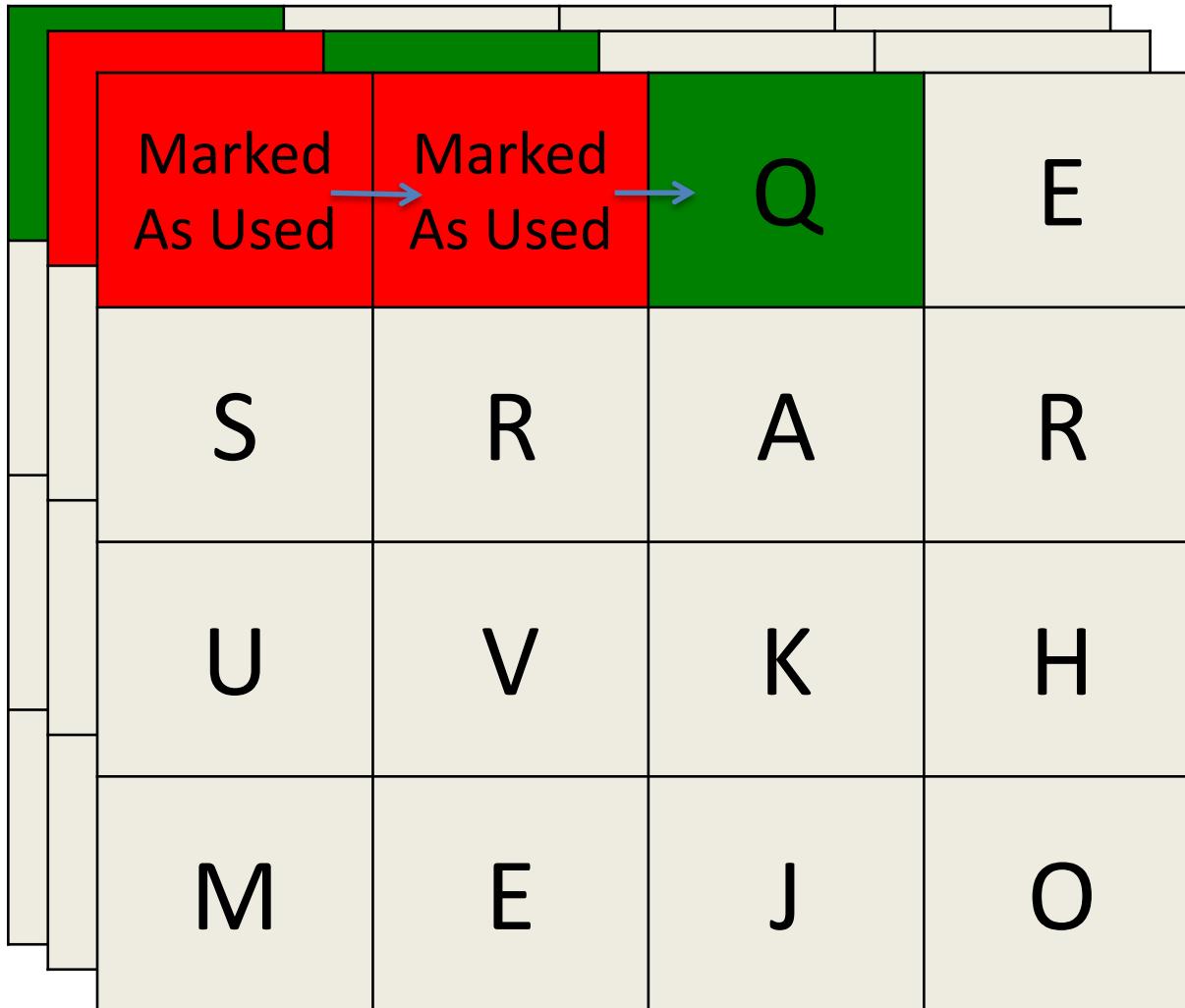
Marked
As Used



Select each neighbor in turn and recurse down.

computerWordSearch () Demo

word so far: “EAQ”



Select each neighbor in turn and recurse down.

BUT WAIT! EAQ
is not the start
of any english
word! So should we
continue??

computerWordSearch () Demo

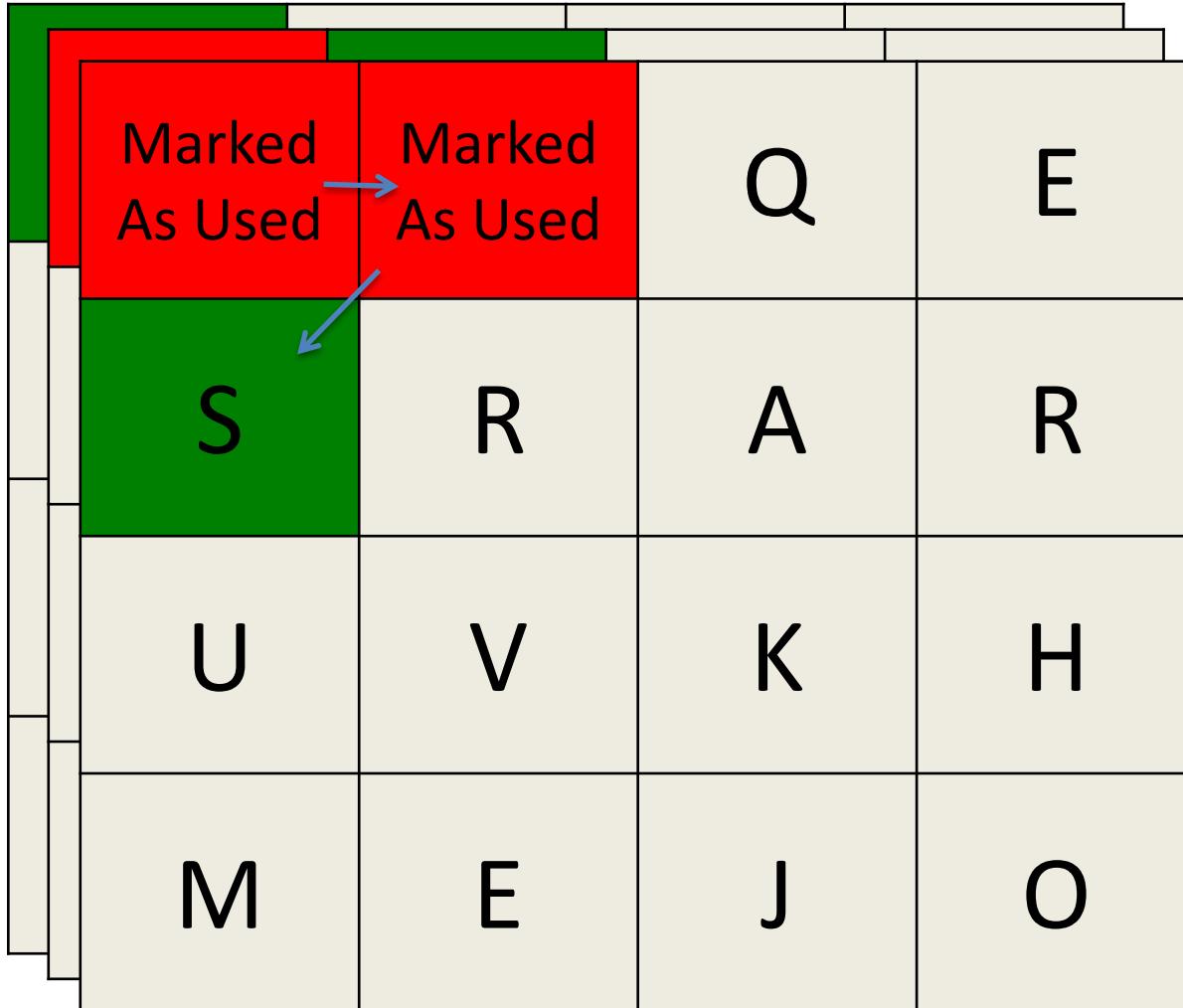
word so far: “EA”

Marked As Used	A	Q	E
S	R	A	R
U	V	K	H
M	E	J	O

Select each neighbor in turn and recurse down.

computerWordSearch () Demo

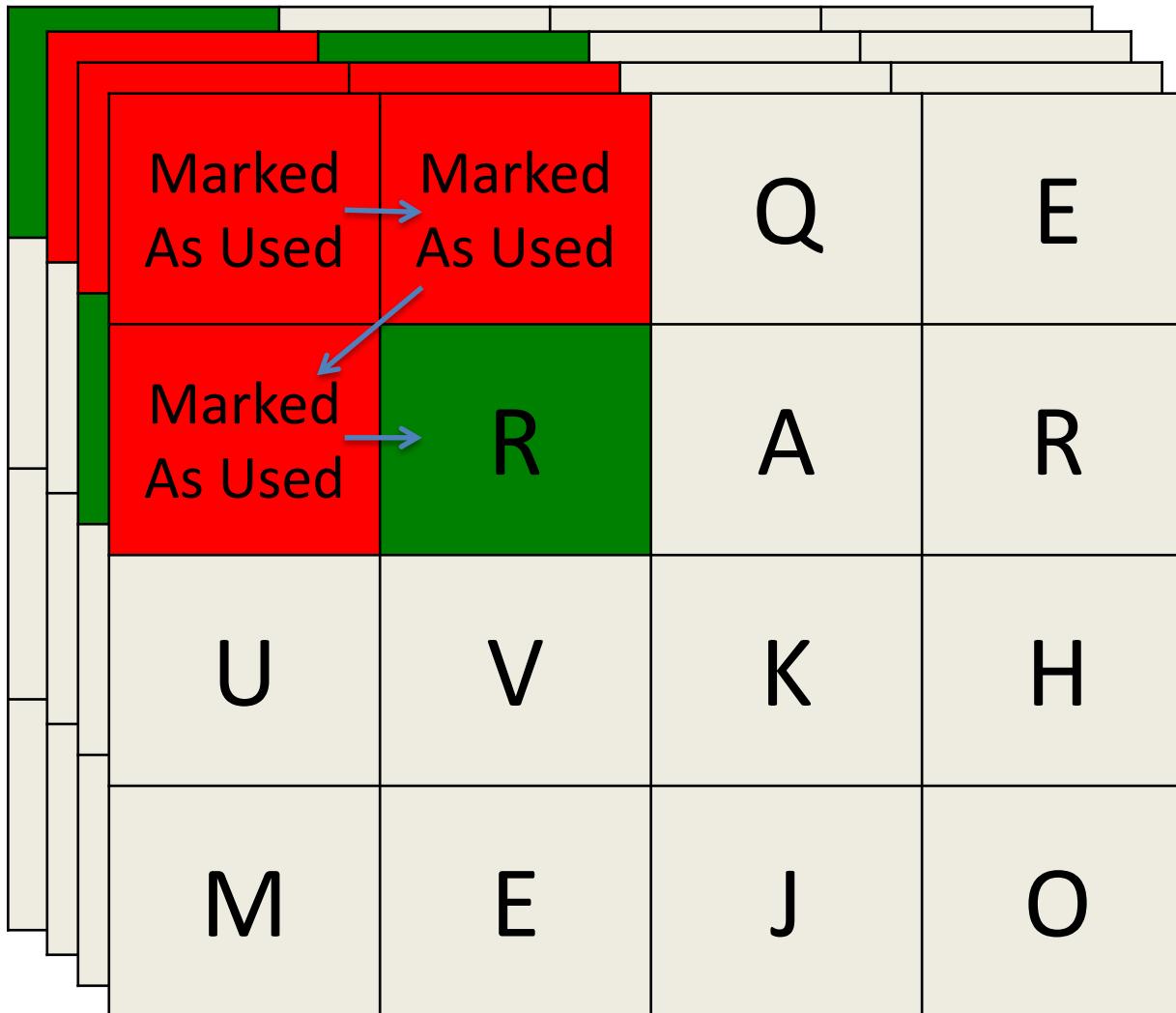
word so far: “EAS”



Select each neighbor in turn and recurse down.

computerWordSearch () Demo

word so far: “EASR”

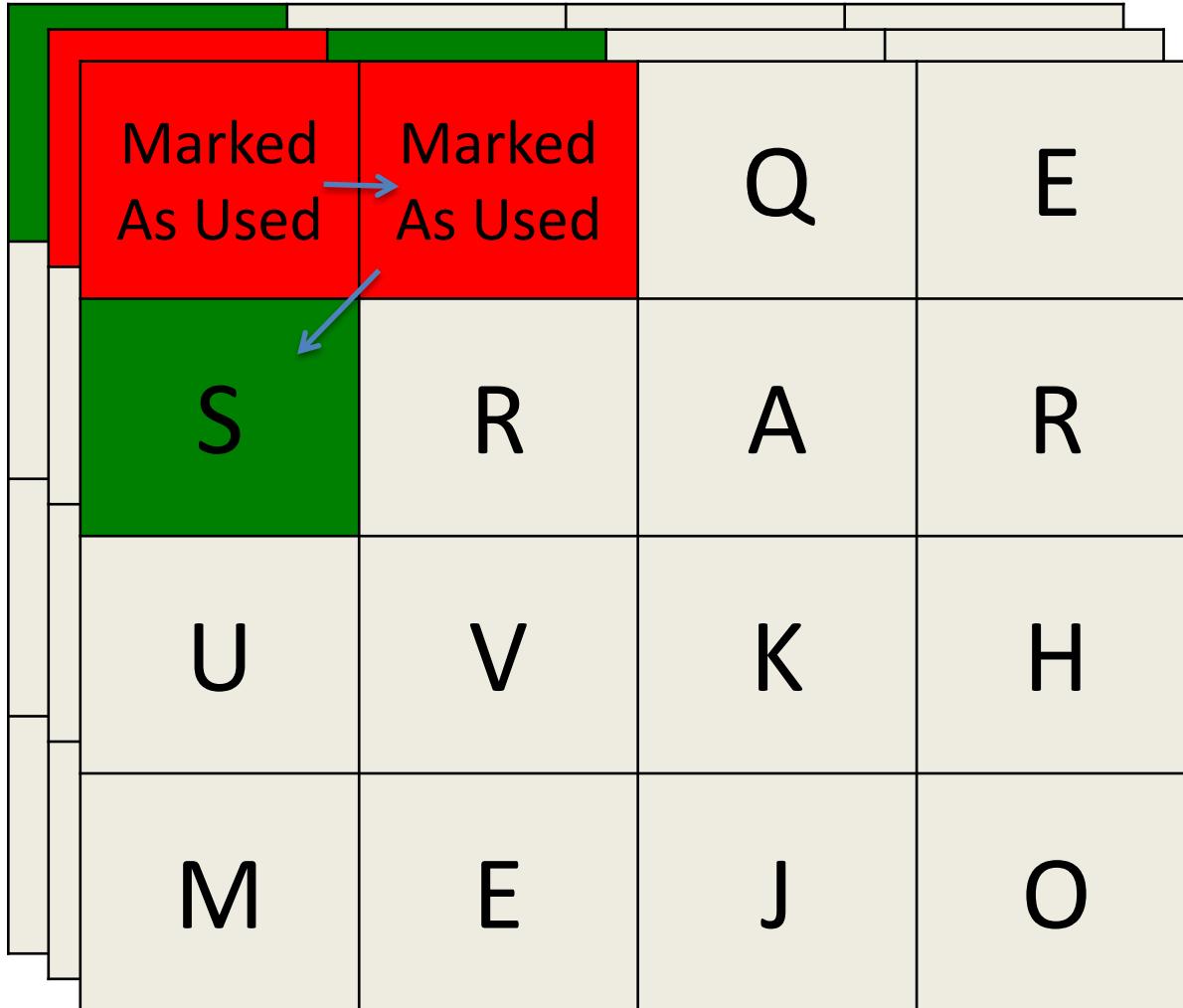


Select each neighbor in turn and recurse down.

But wait, no word begins with EASR!

computerWordSearch () Demo

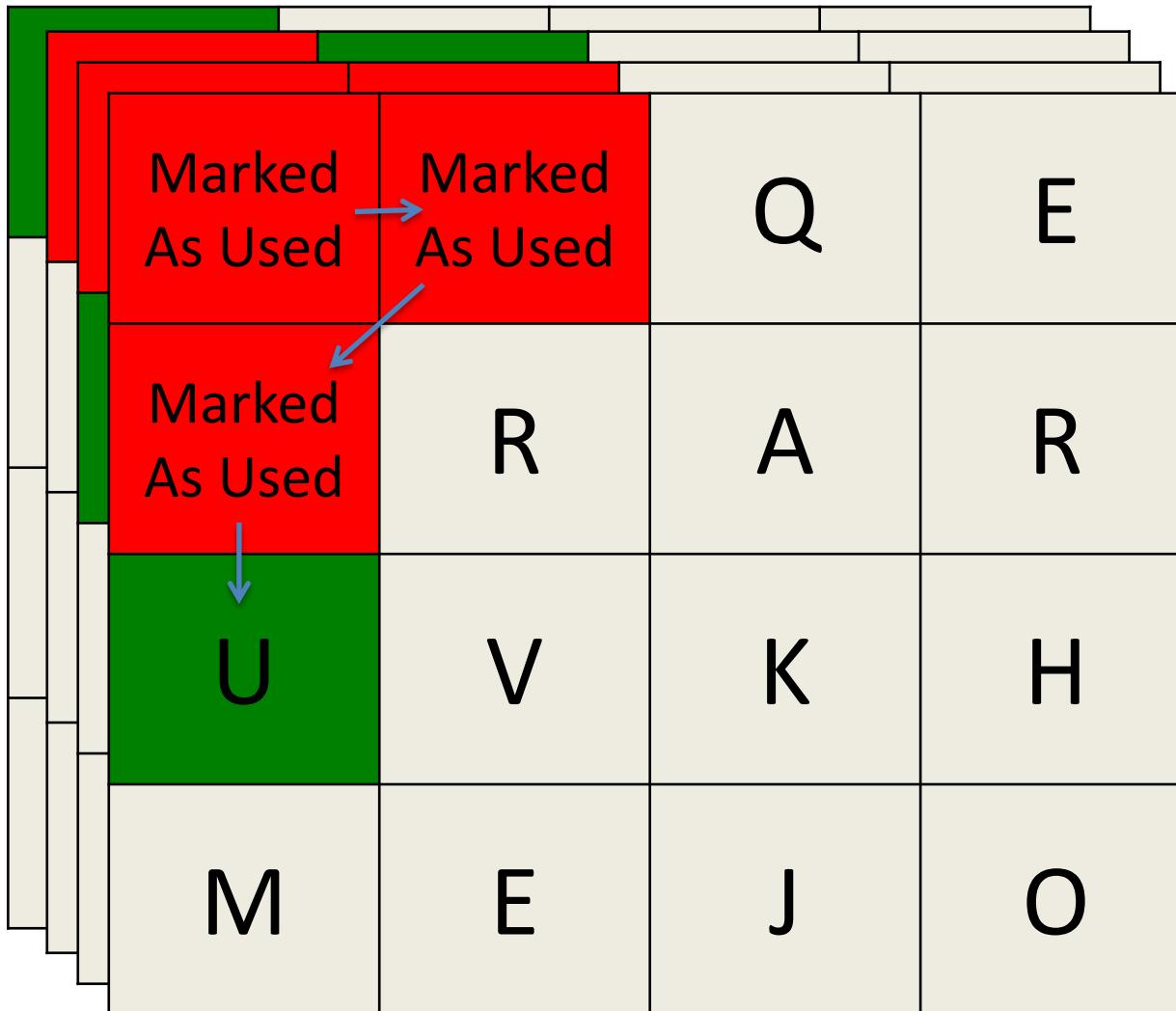
word so far: “EAS”



Select each neighbor in turn and recurse down.

computerWordSearch() Demo

word so far: “EASU”

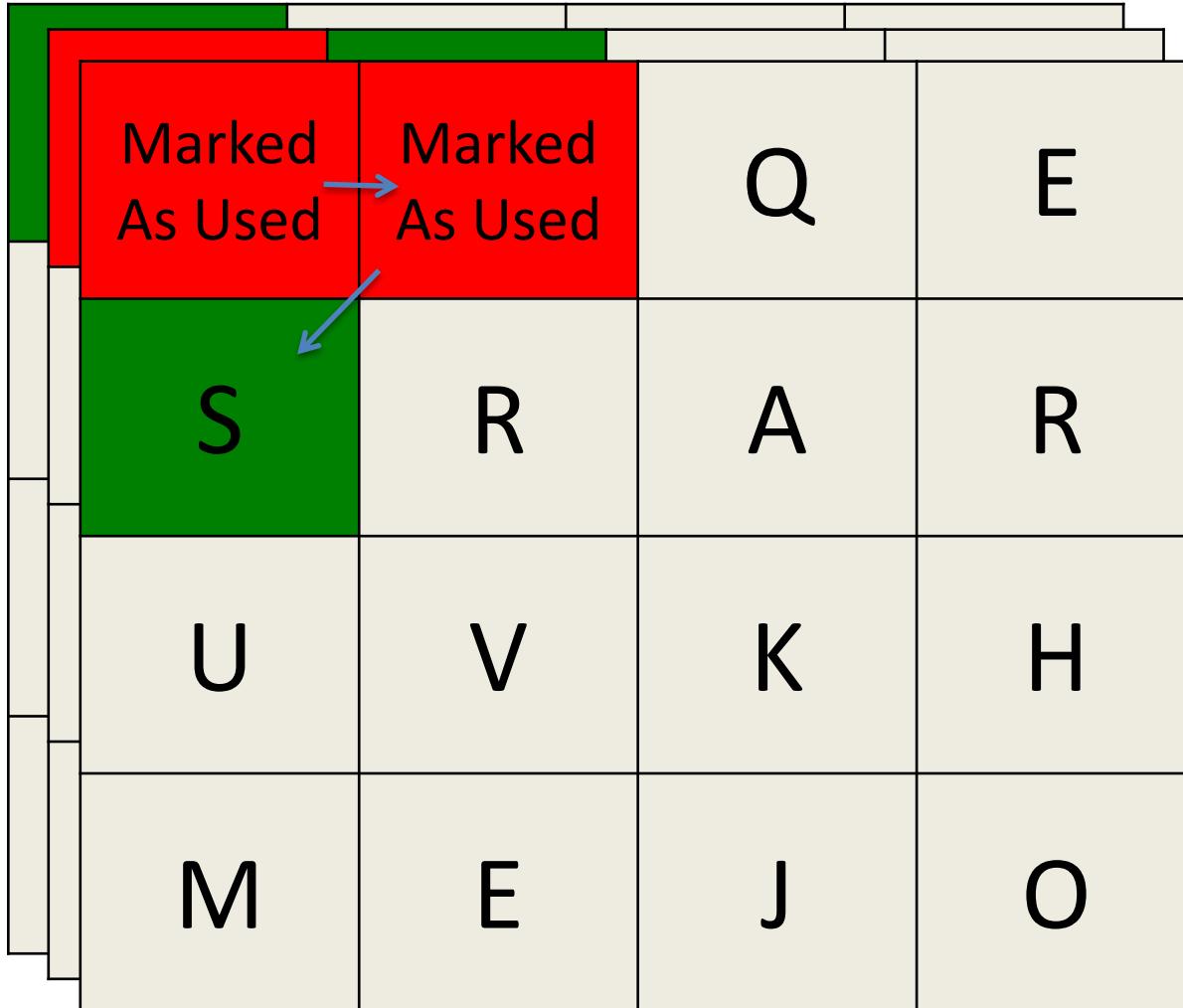


Select each neighbor in turn and recurse down.

But wait, no word begins with “EASU”!

computerWordSearch () Demo

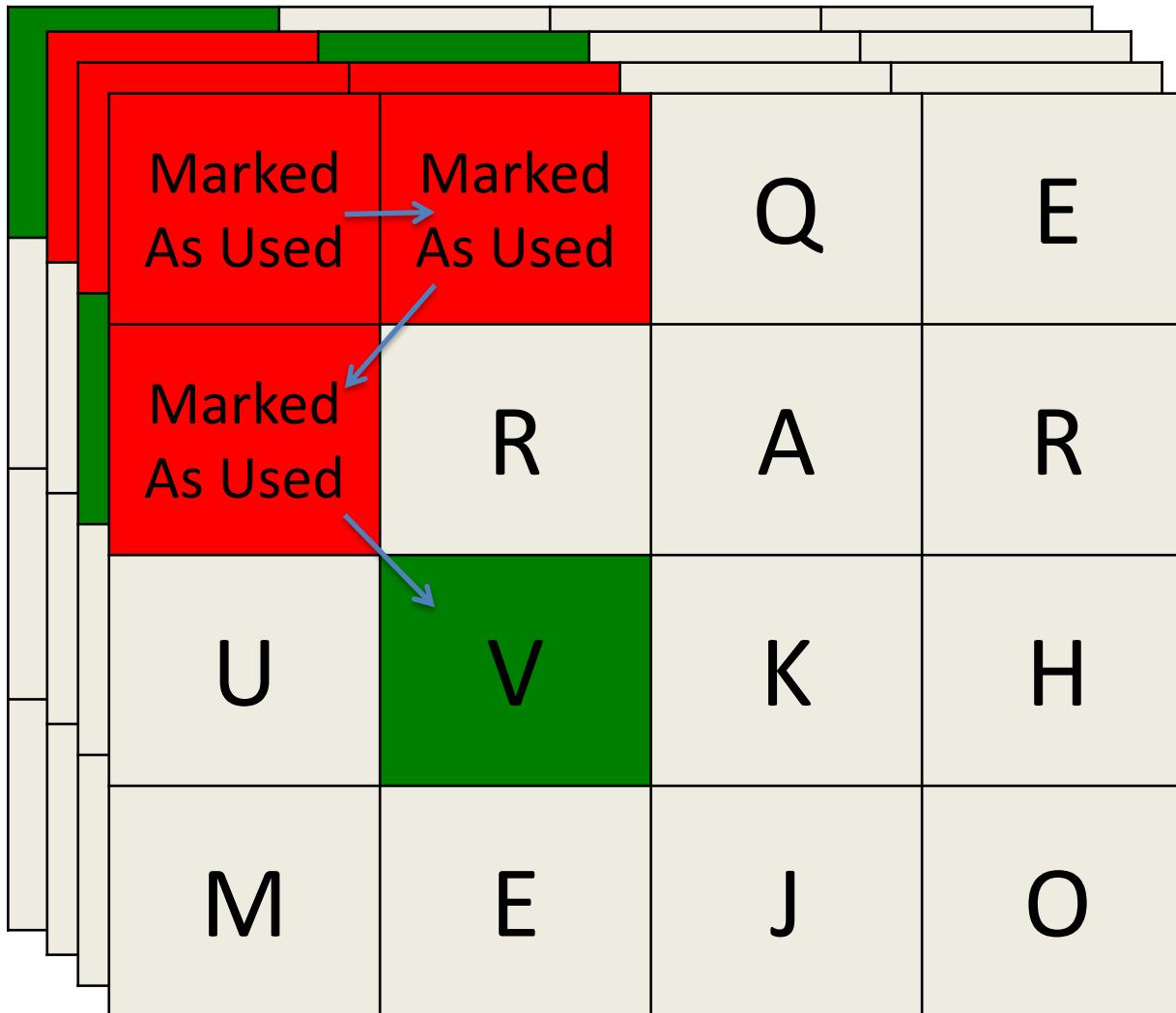
word so far: “EAS”



Select each neighbor in turn and recurse down.

computerWordSearch() Demo

word so far: “EASV”

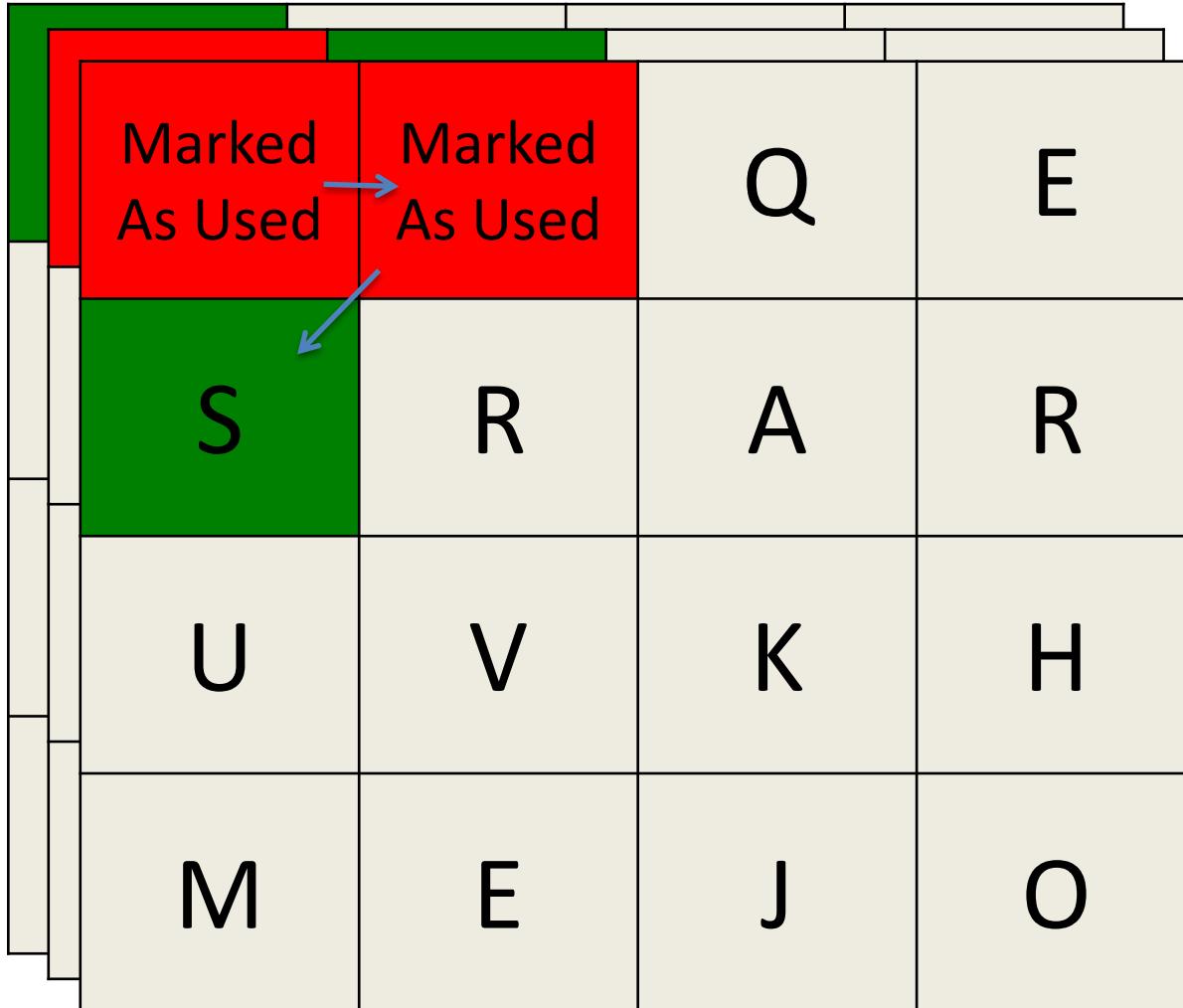


Select each neighbor in turn and recurse down.

STOP! No words start with “EASV”!

computerWordSearch () Demo

word so far: “EAS”



Select each neighbor in turn and recurse down.

We have looked at all of S's neighbors, so we will head back up.

computerWordSearch () Demo

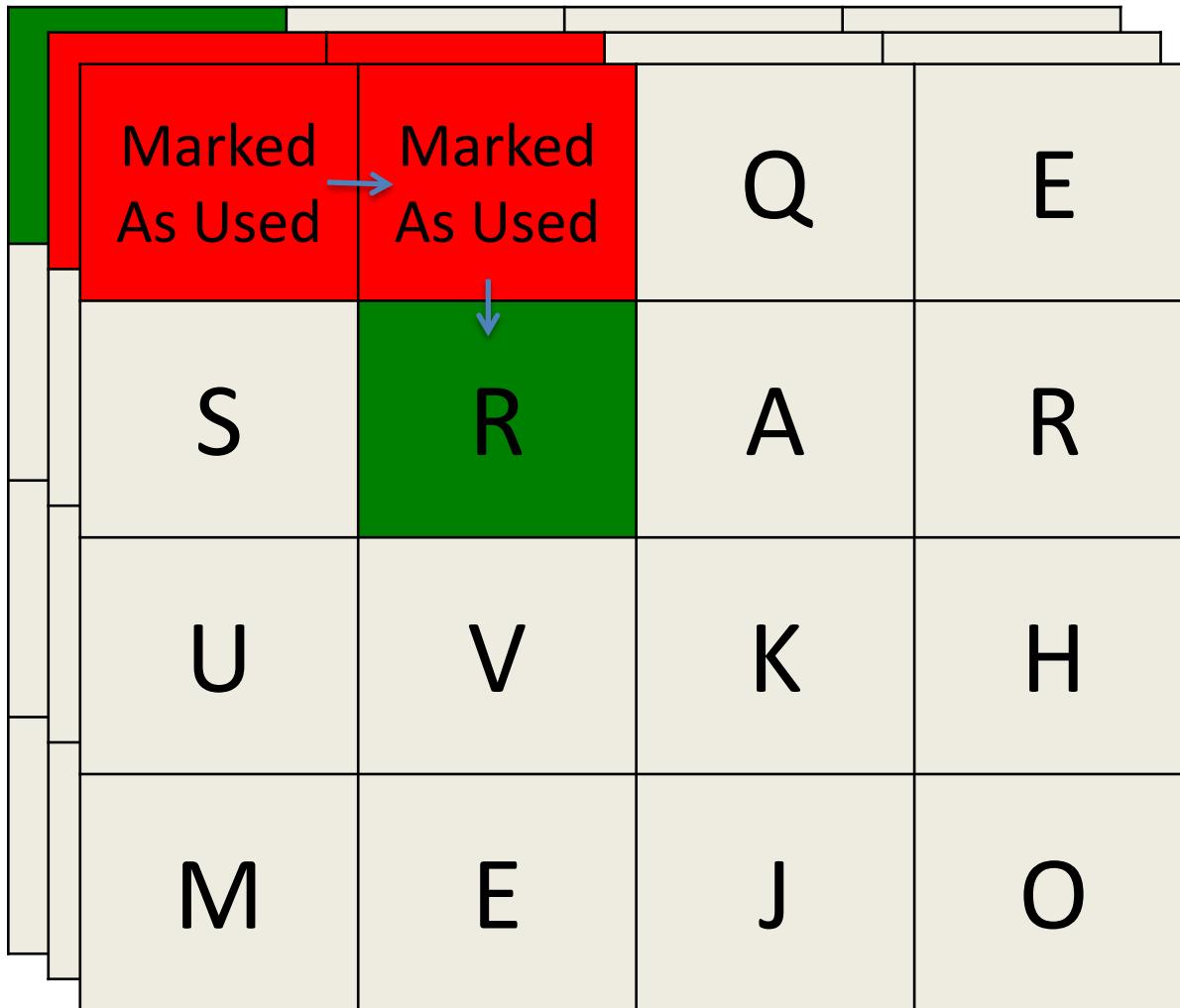
word so far: “EA”

Marked As Used	A	Q	E
S	R	A	R
U	V	K	H
M	E	J	O

Select each neighbor in turn and recurse down.

computerWordSearch () Demo

word so far: “EAR”

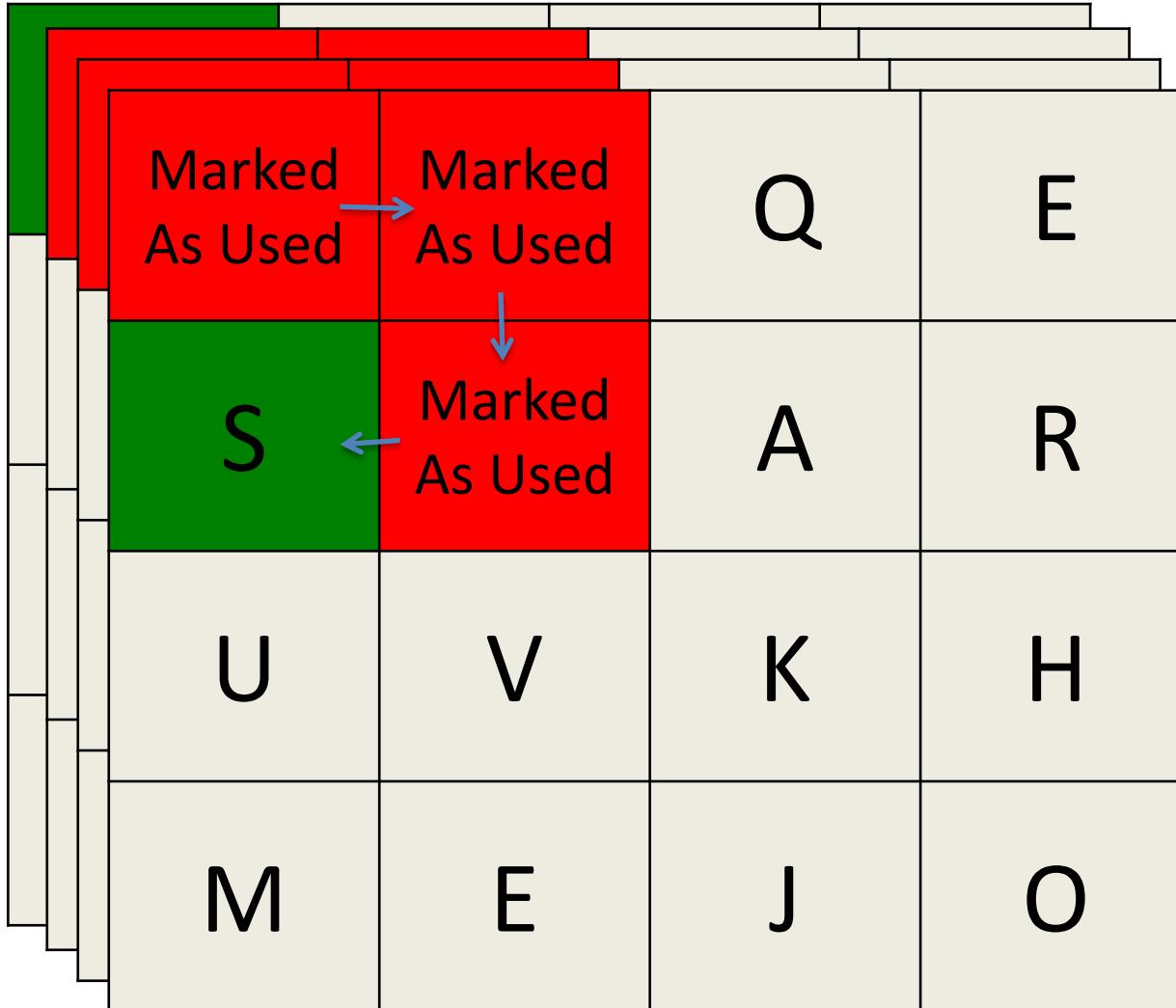


Select each neighbor in turn and recurse down.

“EAR” is a word, *but it is not 4 letters.*

computerWordSearch () Demo

word so far: “EARS”



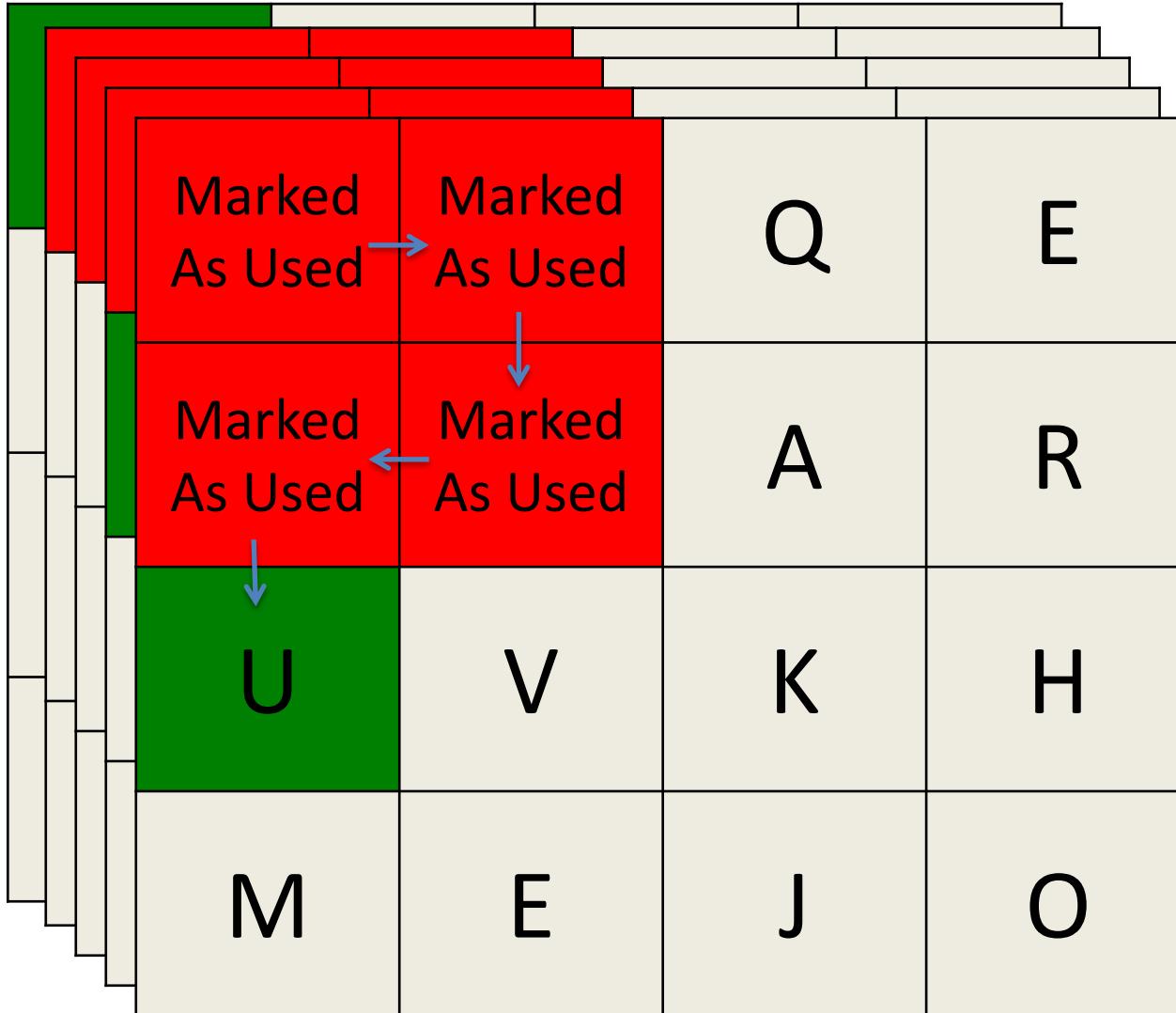
Select each neighbor in turn and recurse down.

“EARS”! Hey, that’s a word and it’s 4 letters at least.

Let’s add it to our set, and **keep looking!**

computerWordSearch () Demo

word so far: “EARSU”



Select each neighbor in turn and recurse down.

Useful Code:

```
#include ""
lexicon.containsPrefix(stringword_so_far);
```

Part 5: Loop

- Most of this is handled already.
- bogglemain has a for loop that calls playOneGame

Part 6: GUI

- Read boggleui.h and understand what each function does and how to use them

Last Notes:

- What are these “::”
 - namespace
 - If you’re in boggleplay.cpp/boggle.cpp and want to use a method like initialize(row, col) in bogglegui.h you have to call BoggleGUI::initialize(row, col)
- const
- Remember boggleplay.cpp has no idea what the rules of boggle are.
- Case insensitivity