

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`
- `bogglegui.h`
- `bogglegui.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	ABBJOO	ACHOPS	AFFKPS	AOOTTW	CIMOTU	DEILRX	DELRVY
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

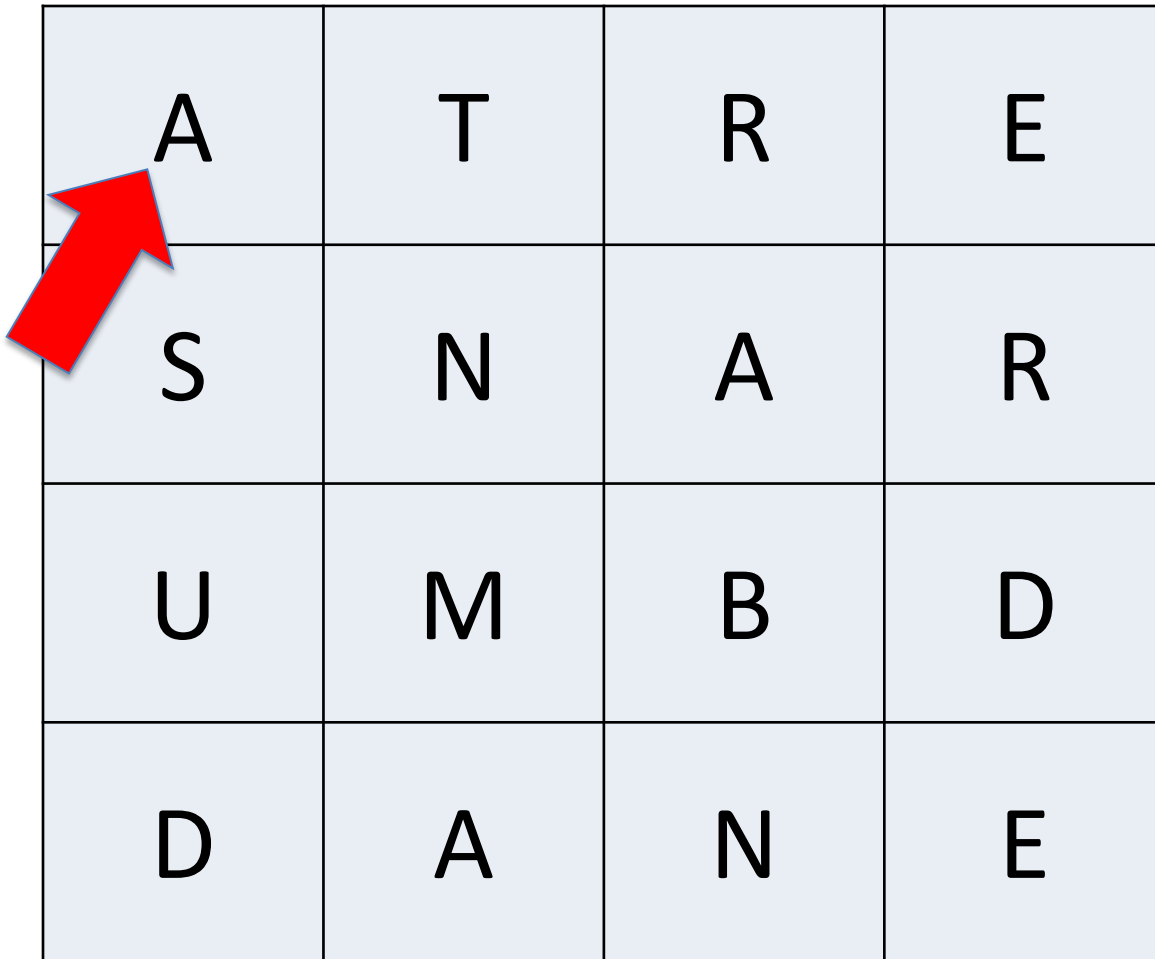
- Ask User for Input
 - Check that it's a valid word
 - ≥ 4 letters long
 - In the dictionary
 - Check that it can be formed in the board
 - If it can be found:

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

word = "smart"


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



humanWordSearch Demo

word = "smart"


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



humanWordSearch Demo

word = "smart"

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



humanWordSearch Demo

word = "smart"

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

humanWordSearch Demo

word = "mart"

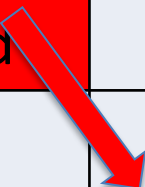
A	T	R	E
Marked As Used	N	A	R
U	M	B	D
D	A	N	E

- We found the first letter
 - 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

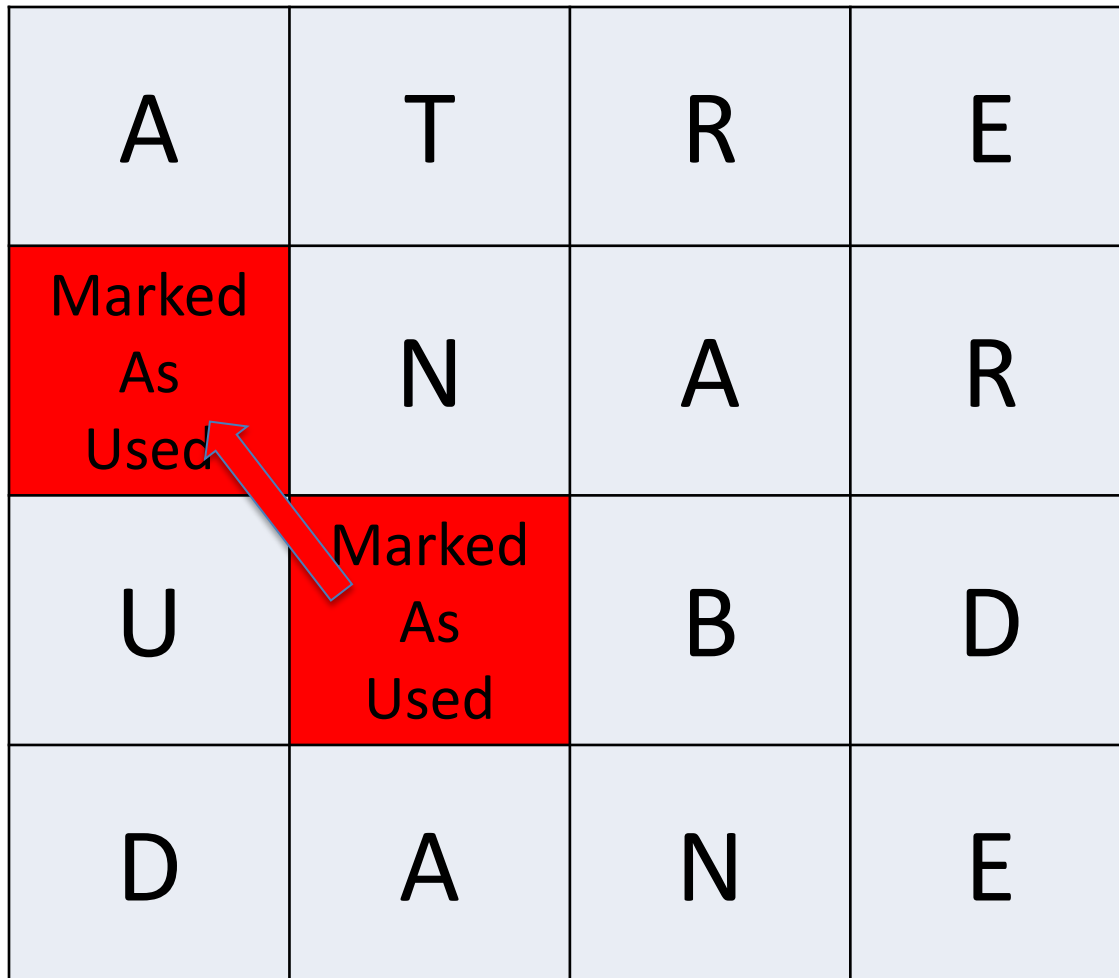


- We found the first letter
 - Mark it as used
 - Why?
 - Highlight square
 - Look at its neighbors for the second letter.
- **Found it, now do it again.**

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"

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: "EAQ"

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

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

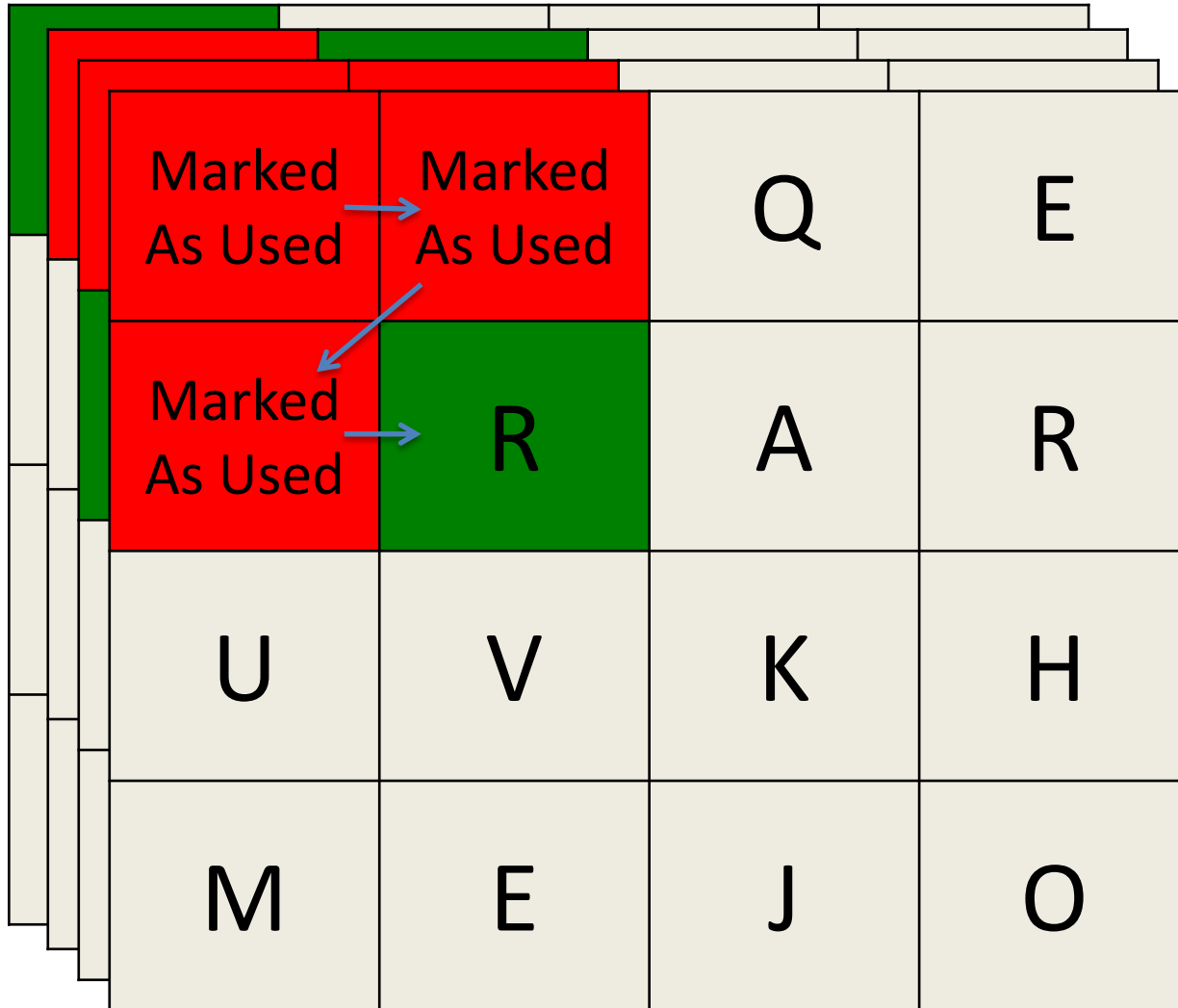
word so far: "EAS"

Marked As Used	Marked As Used	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: "EASR"



Select each neighbor in turn and recurse down.

But wait, no word begins with EASR!

computerWordSearch () Demo

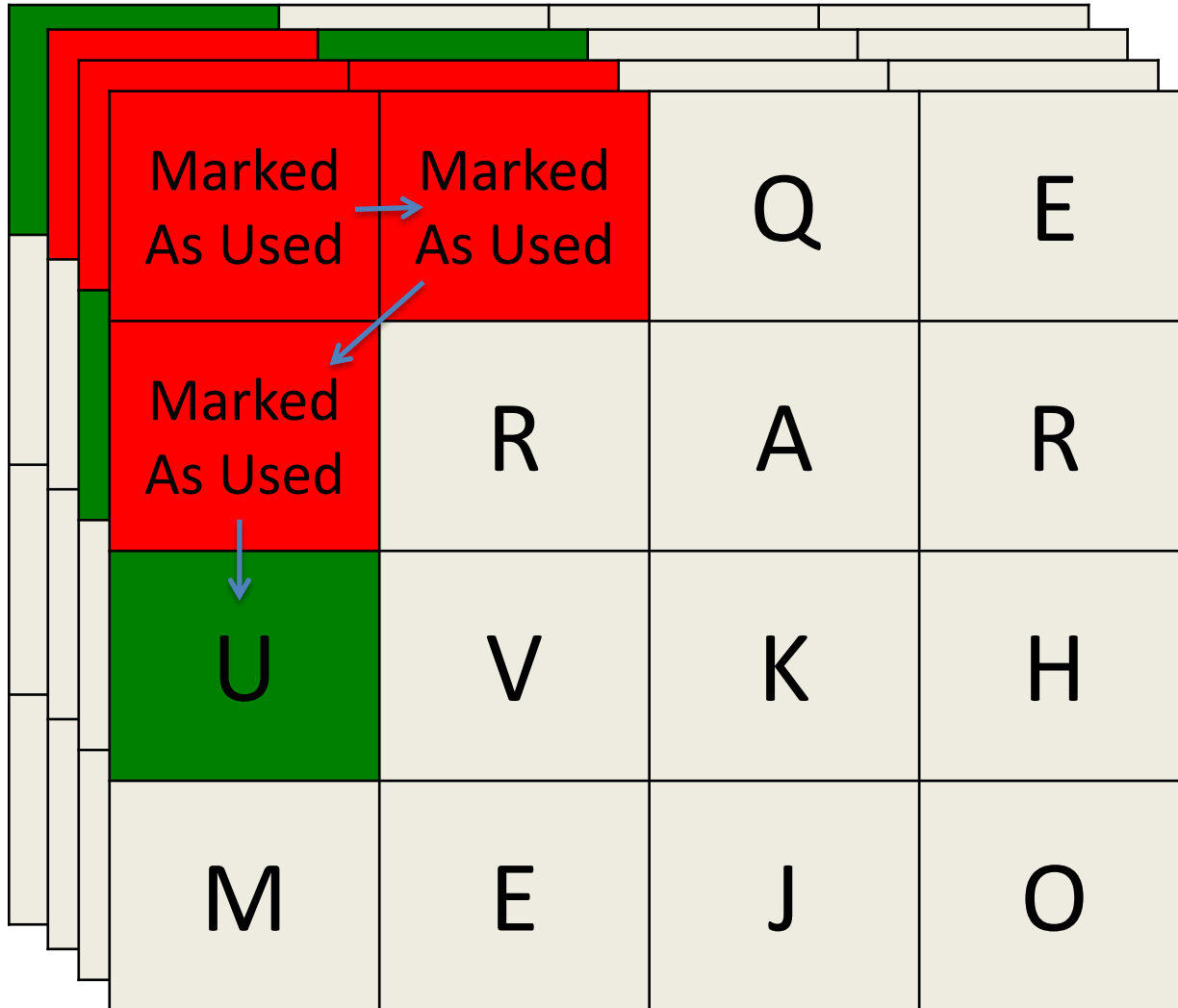
word so far: "EAS"

Marked As Used	Marked As Used	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: "EASU"



Select each neighbor in turn and recurse down.

But wait, no word begins with "EASU"!

computerWordSearch () Demo

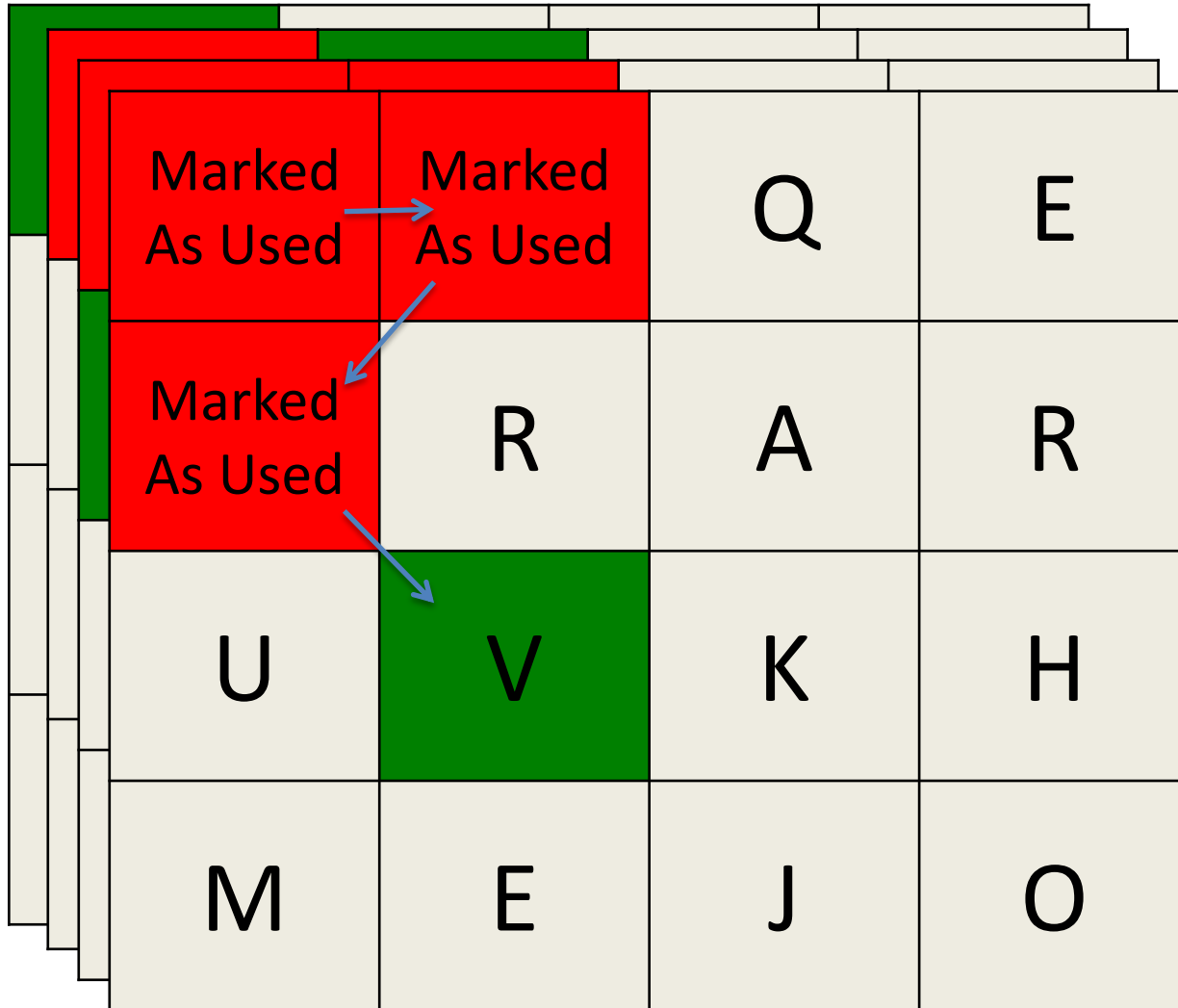
word so far: "EAS"

Marked As Used	Marked As Used	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: "EASV"



Select each neighbor in turn and recurse down.

STOP! No words start with "EASV"!

computerWordSearch () Demo

word so far: "EAS"

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

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"

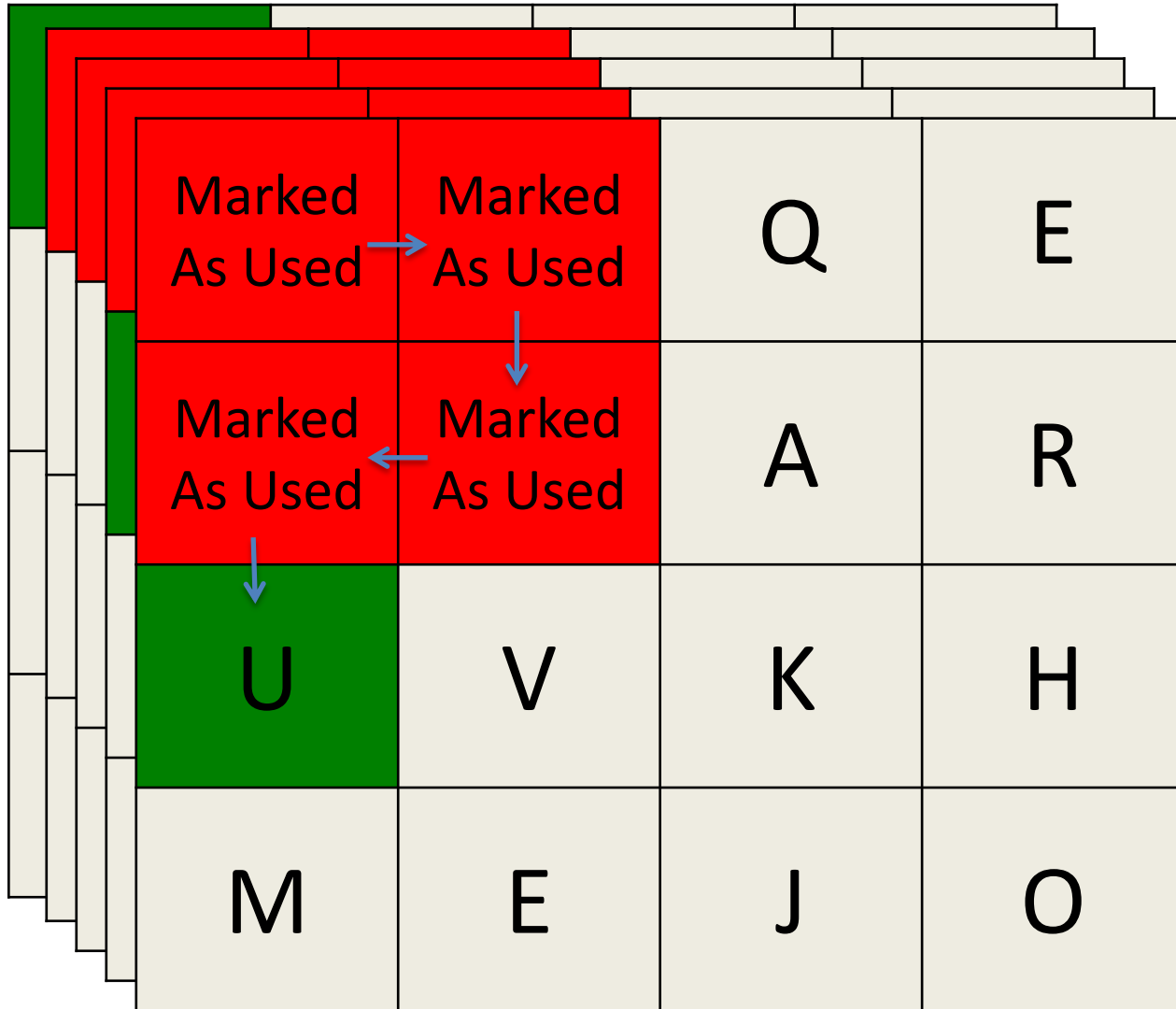
Marked As Used	Marked As Used	Q	E
S	R	A	R
U	V	K	H
M	E	J	O

Select each neighbor in turn and recurse down.

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

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 `bogglegui.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