

ECE 220 Computer Systems & Programming

Recursion



Illustration due to Jennifer S. Kay, “Using the force: how star wars can help you teach recursion,” *Journal of Computing Sciences in Colleges* 15(5):274-284 Jan 2020.

The Force

Magical power in Star Wars

The Force can help you achieve monumental tasks, if you
believe in it,
are one with it,
allow it to help you

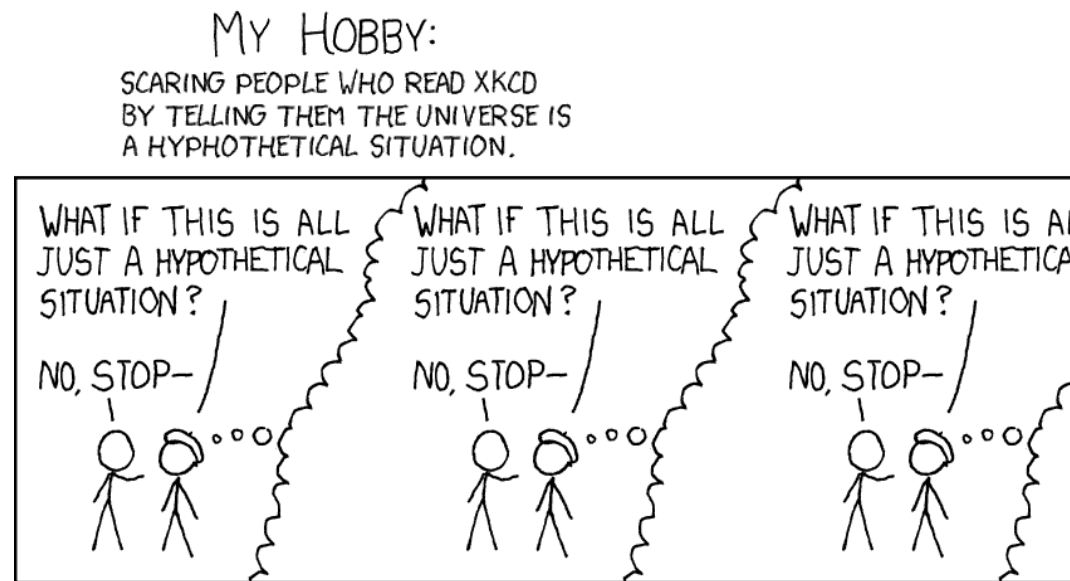


Image: [starwars.com](https://www.starwars.com), accessed 7/22/20

Recursion

Non-magical technique in algorithms

Recursion can help you achieve monumental tasks, if you
believe in it,
~~are one with it,~~
allow it to help you,
always progress to a base case



XKCDSW #1954. Accessed 7/22/20

Example: Count Down

- Print all values from current number down to 1, inclusive.
- Step 1: build the prototype

```
void count_down(unsigned int from);
```

Example: Count Down

- Print all values from current number down to 1, inclusive.
- Step 2: describe function in a comment

```
/* prints values from "from" down to 1, inclusive. */  
void count_down(unsigned int from);
```

Example: Count Down

- Print all values from current number down to 1, inclusive.
- Step 3: implement base case[s]: typically solve the easiest cases

```
/* prints values from "from" down to 1, inclusive. */  
void count_down(unsigned int from) {  
    if (!from) return;  
}
```

Example: Count Down

- Print all values from current number down to 1, inclusive.
- Step 4: make the problem smaller (progress towards the base case)

```
/* prints values from "from" down to 1, inclusive. */  
void count_down(unsigned int from) {  
    if (!from) return;  
    printf("%d\n", from);  
}
```

Example: Count Down

- Print all values from current number down to 1, inclusive.
- Step 5: use the force (pretend the comment is true)

```
/* prints values from "from" down to 1, inclusive. */  
void count_down(unsigned int from) {  
    if (!from) return;  
    printf("%d\n", from);  
    count_down(from-1);  
}
```



XKCDSW #3963

Example: Count Down

- Print all values from current number down to 1, inclusive.
- Step 6: assemble the results (if necessary)

```
/* prints values from "from" down to 1, inclusive. */  
void count_down(unsigned int from) {  
    if (!from) return;  
    printf("%d\n", from);  
    count_down(from-1);  
}
```