CSC148 winter 2014

more recursion

week 4

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Outline

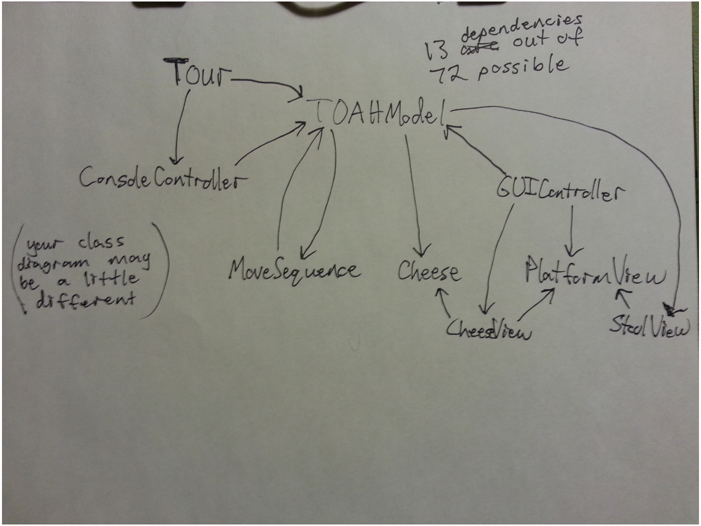
A1 class design

More recursion

Testing, big and small

Functional Programming

Separation of concerns



Tracing to understand recursion

[[5, 3], 1, [4, [2, [3]]], 3]

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Red part is the current value of L.

```
def remove3s(L:list):
  i = 0
  while i < len(L):
    if isinstance(L[i],int):
      if L[i] == 3:
        del L[i]
        continue
    elif isinstance(L[i],list):
      remove3s(L[i])
    i += 1
```

a relevant example

This is a job for recursion:

$$M(n) = \begin{cases} 1 & n == 1 \\ \min\left\{1 \leq i < n \mid 2 \times M(n-i) + 2^i - 1\right\} & \text{otherwise.} \end{cases}$$

That's a recursive formula. Python has a built-in function `min`. You probably want to combine (tuple?) the minimum number of moves with the split (i) that produces it.

get some turtles to draw

Spawn some turtles, point them in different directions, get them to draw a little and then spawn again…

Try out `tree_burst.py`

before and after coding:

Test your docstring examples automatically:

```
if __name__ == ’__main__’:
    import doctest
    doctest.testmod()
```

For more thorough testing, use unittest

Nameless functions with lambda

Writing `(lambda x: one-line-function-body)` in a given place in your code accomplishes the same thing as first defining a function

```
def fn_name(x):
    one-line-function-body
```

and then writing `fn_name` in that same place in your code.

```
def square(x:int):
   return x**2
print(square(5))
```

```
print((lambda x: x**2)(5))
```

Nothing deep!
It is simply more-concise and doesn't require you to introduce a name for the function, which is good *if you're only going to use the function once.*

Useful built-in functions to use with lambda

- `map(f, iterable_object)` returns an object of the same type and size as `iterable_object` obtained by applying the function f to each of `iterable_object`. What's this do?

  ```
  map(lambda x: x**2, [1, 0, 4, -1])
  ```

  You already know this one! Same as

  ```
  [x**2 for x in [1,0,4,-1]]
  ```

- `filter(f, iterable_object)` returns an object of the same type as `iterable_object` that contains only the elements $x \in$ `iterable_object` such that `f(x)` return true. What's this do?

  ```
  filter(lambda x: x > 0, [1, 0, 4, -1])
  ```