Classes and Objects

Introduction

Computer science is the study of algorithms

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Classes and objects combine functions and data

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make one thing act like another

Functions turn many steps into one (logical) step

Libraries group functions to make them manageable

Classes and objects combine functions and data

And, if used properly, do much more as well

Simple simulation of aquarium containing

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plants

Simple simulation of aquarium containing

plants snails

Simple simulation of aquarium containing

plants snails fish

Simple simulation of aquarium containing

plants snails fish

don't move

photosynthesize

Simple simulation of aquarium containing

plants	snails	fish
don't move	crawl in 2D	
photosynthesize	scavenge	

Simple simulation of aquarium containing

plants	snails	fish
don't move	crawl in 2D	swim in 3D
photosynthesize	scavenge	hunt

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Algorithm is simple

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Algorithm is simple

```
for t in
  range(timesteps):
  move(world,
  everything)
  eat(world,
  everything)
  show(world,
```

Simple simulation of aquarium containing

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Algorithm is simple

```
for t in
  range(timesteps):
  move(world,
  everything)
  eat(world,
  everything)
  show(world,
```

Program is more complicated

```
def move(world, everything):
  for thing in everything:
    if thing[0] == 'plant':
      pass      # plants don't move
    elif thing[0] == 'snail':
      move_snail(snail)
    elif thing[0] == 'fish':
      move_fish(fish)
```

```
def move(world, everything):
    for thing in everything:
        if thing[0] == 'plant':
            pass        # plants don't move
        elif thing[0] == 'snail':
            move_snail(snail)
        elif thing[0] == 'fish':
            move_fish(fish)
```

So far, so good

```
def eat(world, everything):
  for thing in everything:
    if thing[0] == 'plant':
      photosynthesize(world, plant)
    elif thing[0] == 'snail':
      scavenge(world, snail)
    elif thing[0] == 'fish':
      prey = hunt(world, everything,
  thing)
      if prey != None:
        devour(world, everything,
  thing, prey)
```

software carpentry

```
def eat(world, everything):
  for thing in everything:
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    elif thing[0] == 'fish':
      prey = hunt(world, everything,
  thing)
      if prey != None:
        devour(world, everything,
  thing, prey)
```

Hmmé

```
def show(world, everything):
  show_world(world)
  for thing in everything:
    if thing[0] == 'plant':
      show_plant(plant)
    elif thing[0] == 'snail':
      show_snail(snail)
    elif thing[0] == 'fish':
      show_fish_fish)
```

```
def show(world, everything):
  show_world(world)
  for thing in everything:
    if thing[0] == 'plant':
      show_plant(plant)
    elif thing[0] == 'snail':
      show_snail(snail)
    elif thing[0] == 'fish':
      show_fish_fish)
```

This is starting to look familiaré

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What about fish that eat plants? Or scavenge?

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What about fish that eat plants? Or scavenge?

Optimist: every pattern in a program is an opportunity to shorten that program

Wouldn't this be simpler?

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```
for thing in everything:
    thing.move()
    prey = thing.eat(everything)
    if prey:
        thing.devour(prey)
        everything.remove(prey)
```

Wouldn't this be simpler?

```
for thing in everything:
    thing.move()
    prey = thing.eat(everything)
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Easier to understand (after some practice)

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for thing in everything:
  thing.move()
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```

Easier to understand (after some practice)

Much easier to add new kinds of things

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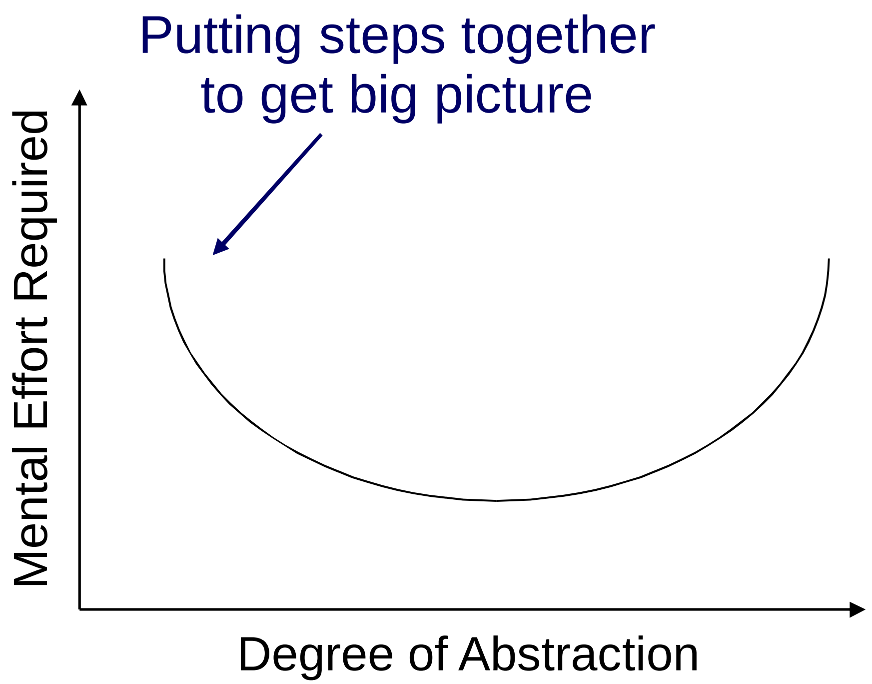

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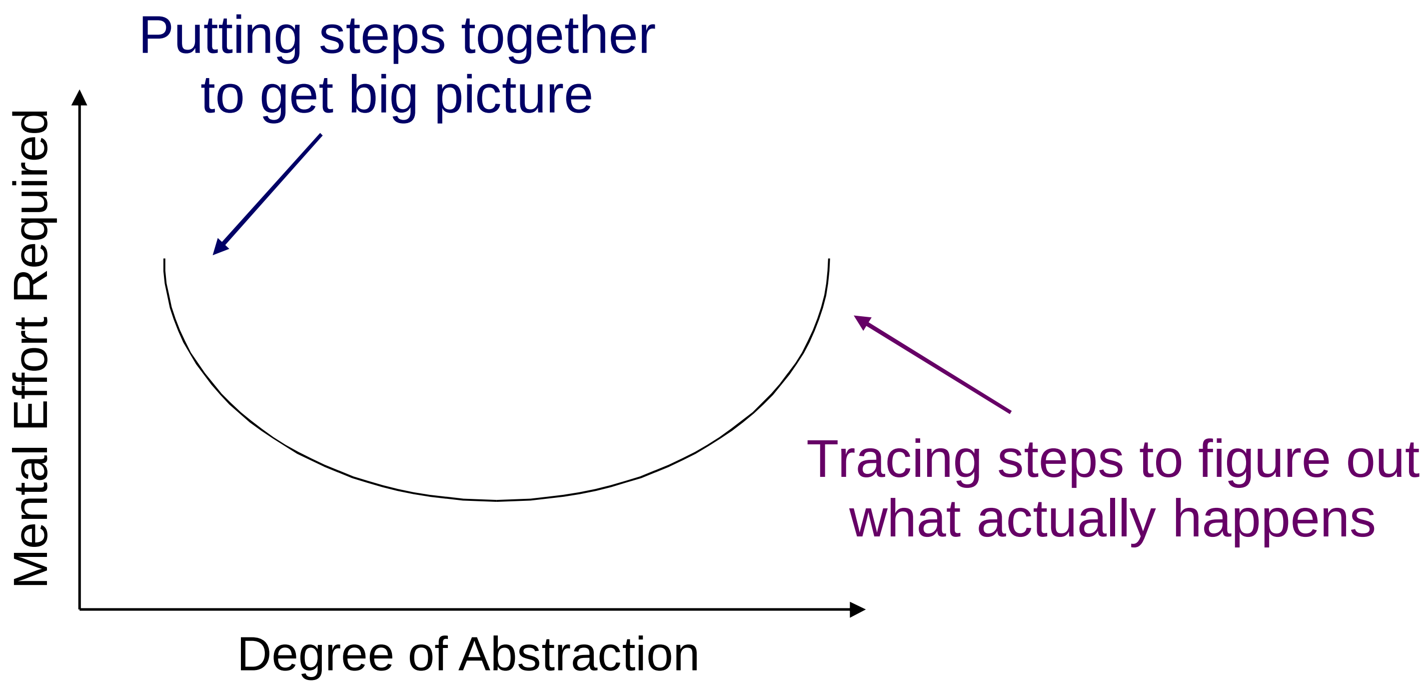

created by

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