Object Oriented Programming 4

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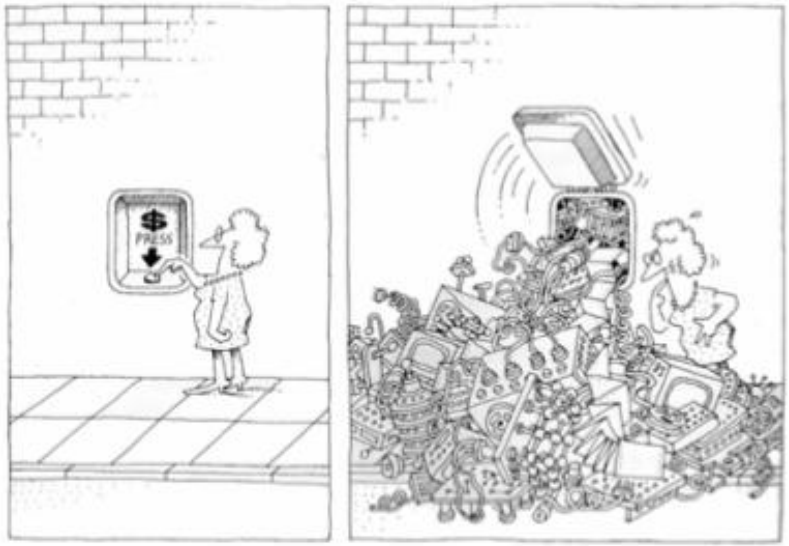
Outline

Introduction

Today, Computers have a lot of impact on the world.
Development of new softwares is leading to development of more and more complex systems.
Personal computer as complex systems. It is arrange in a hierarchy.Each level of hierarchy represents different level of abstraction

Cont...



The task of the software development team is to engineer the illusion of simplicity.

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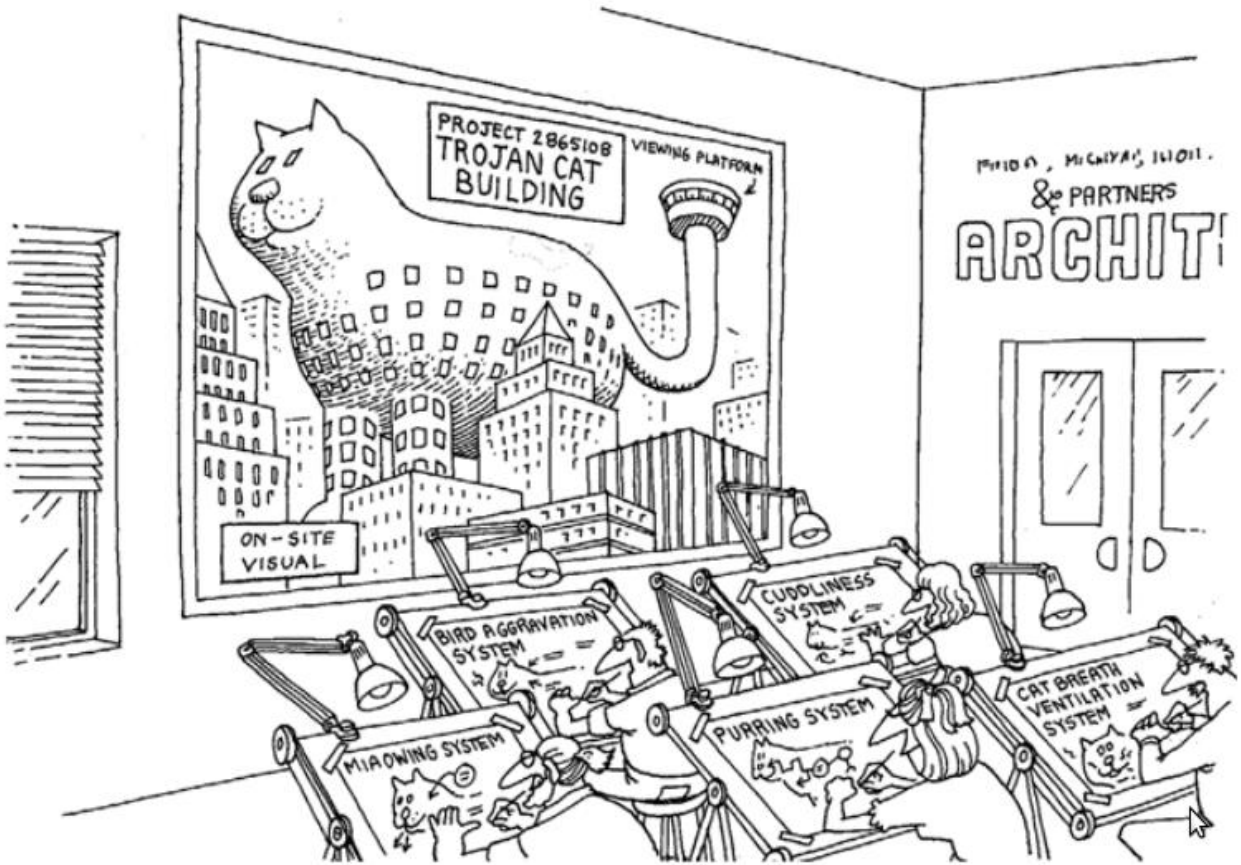
[1] Object Oriented Analysis and Design with Applications 3rd Edition by Grady Booch

Cont...



The architecture of a complex system is a function of its components as well as the hierarchic relationships among these components.

Ways to approach problem solution

Divide and Rule is ancient mode
Algorithmic Decomposition

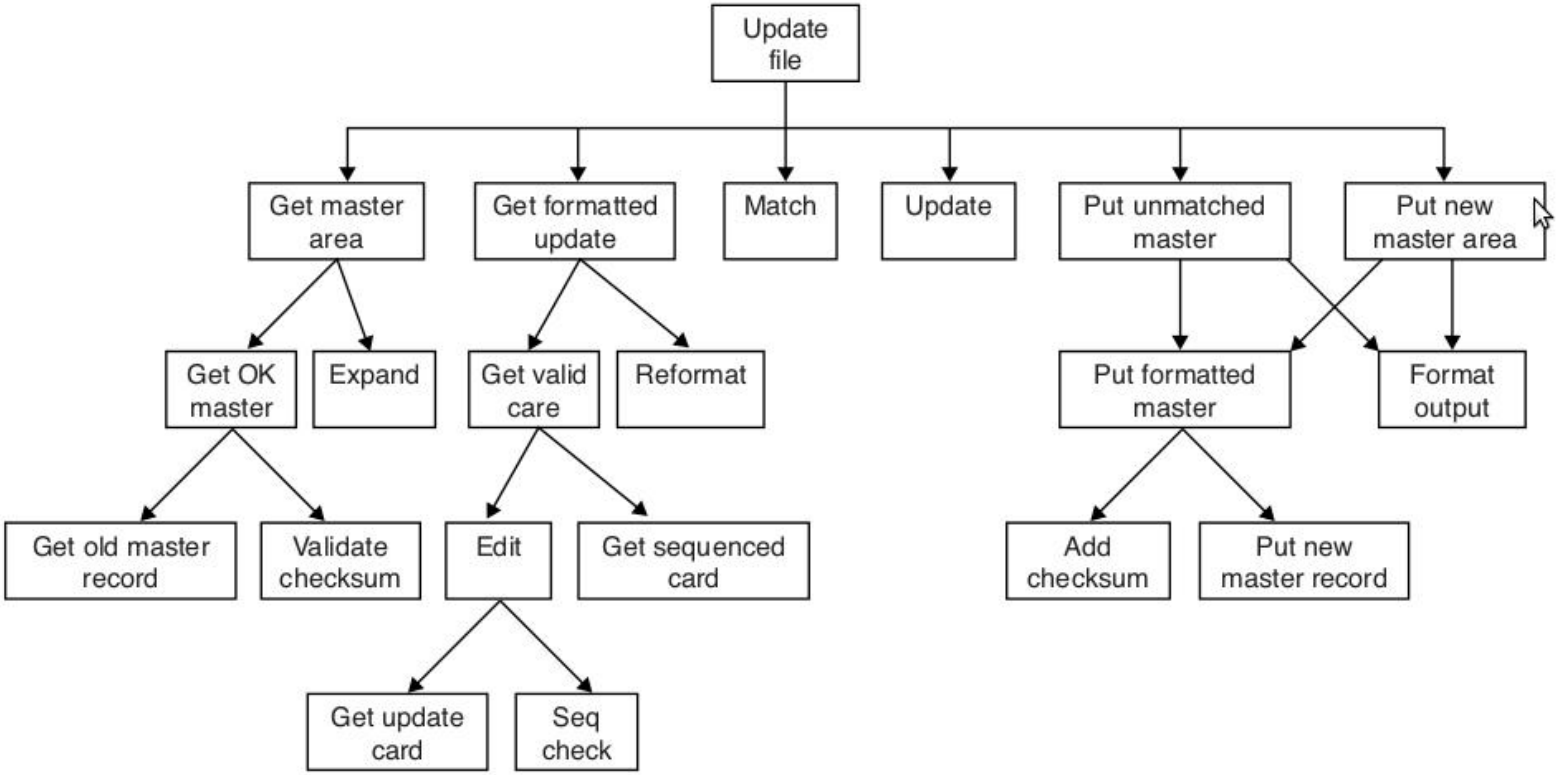


Figure 1–3 Algorithmic Decomposition

Object Oriented Decomposition

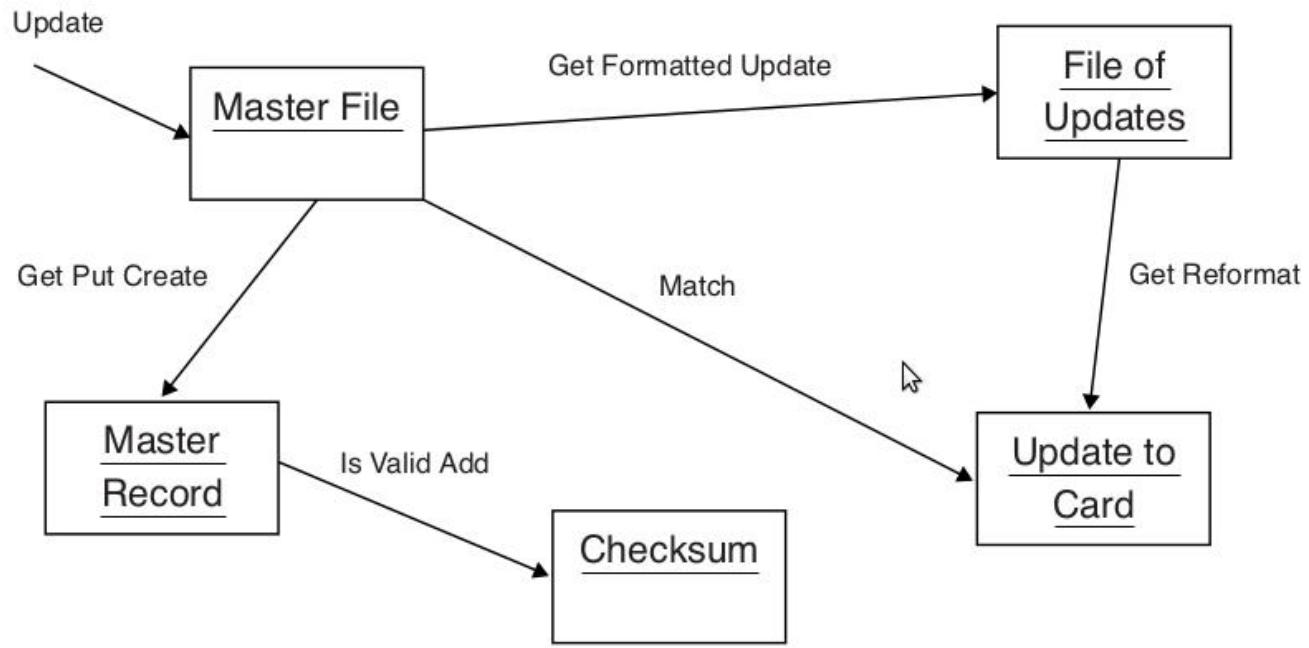


Figure 1–4 Object-Oriented Decomposition

Cont...

Which one to select ?

- Algorithmic decomposition : ordering of events
- Object Oriented decomposition : the agents that either cause action or are the subjects on which these operations act.

Which one is better ?

- Both are better
- Both cant be used simultaneously to solve a problem.

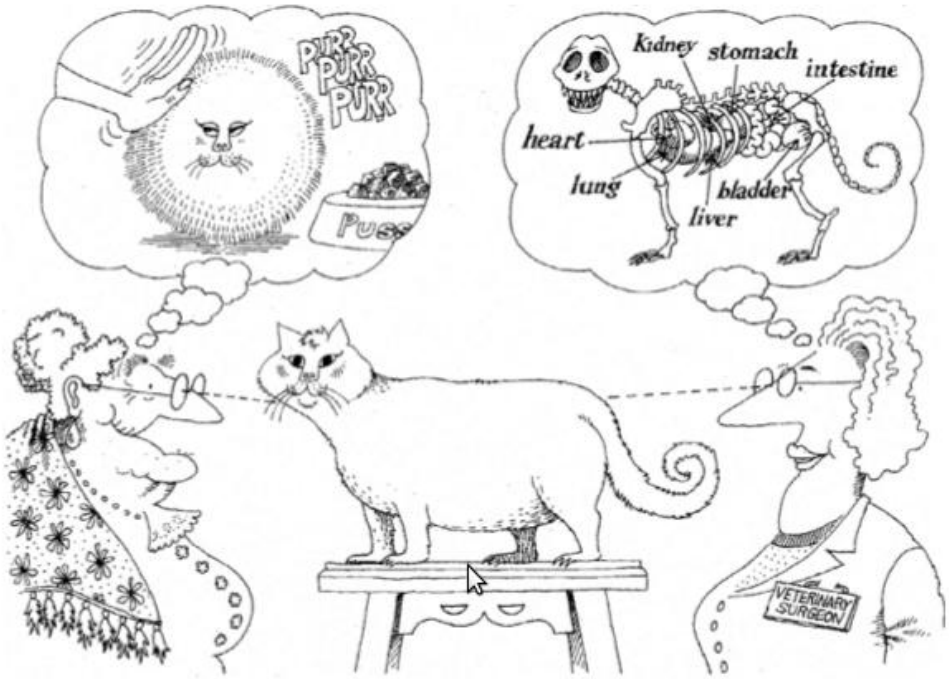
Experience of many people tells to apply OO approach first because it becomes easier to organize complex systems.

Pillars of OO - part 1

1. Abstraction
2. Encapsulation
3. Modularity
4. Hierarchy

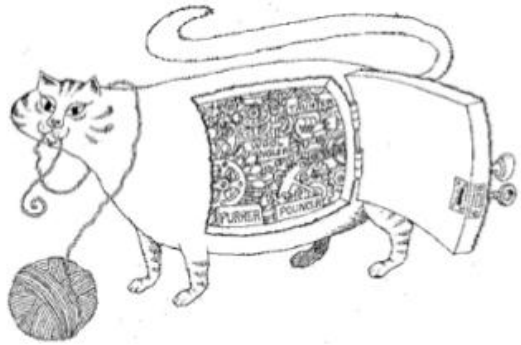
If any one of them is absent its not a OO Language

Abstraction



Abstraction focuses on the essential characteristics of some object, relative to the perspective of the viewer.

Encapsulation



Encapsulation hides the details of the implementation of an object.

Some imp points

Encapsulation and Abstraction go hand in hand.
In practice : Each class should have interface and implementation.
Interface : view of outside world : Encapsulation
Implementation : desired behaviour : Abstraction and implementation

Examples

Classes and Objects :

- C++
- Java
- Python

- Hello World program.

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  - this / self variable.

Modularity

Modularity packages abstractions into discrete units.

Cluster Logically related abstractions
Example : packages in java , modules in python
similar to IC which consits of NAND,NOR and NOT gates

Hierarchy

Abstractions form a hierarchy.

Hierarchy is ranking or ordering of abstractions.

Inheritance

Class Structure : Is a (generalization / specialization relationship)
example : Cat is a mammal , Quick sort is a sorting algorithm
It is also called as inheritance.
Object Structure : Part of (aggregation relationship)
example : plants are part of garden

Examples on inheritance

- Cat is an animal.
- Dog is also an animal.
- Fish is also an animal.
- Man is also an animal.

TODO

Demonstrations in Python

- Lets start program some interesting things .... draw circle, rectangle , square , triangle in python
- use turtle package ...

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```
import turtle
turtle.circle(10)
turtle.goto(0,10)
turtle.goto(10,10)
turtle.goto(10,0)
turtle.goto(0,0)
turtle.penup()
turtle.circle(10)
turtle.goto(0,10)
turtle.goto(10,10)
turtle.goto(10,0)
turtle.goto(0,0)
turtle.pendown()
```

TODO

- Before we start writing always do paper work ...
- Write classes and there relationship on paper
- Now write members and functions