Object Oriented Programming

Using C++ Programming Language

About this course

In this course we will learn about a new programming technique called object-oriented programming.

Concepts will be reinforced by their implementation in C++ (We will program in C++)

About this course…

- 3 Credit Hrs.
- 2 Lectures / Week
- Each Lecture 1.5Hr.

Prerequisites

- Introduction to Programming and C Programming

Syllabus

- Textbook
  - C++ How to Program By Deitel & Deitel
- Reference Material
  - The C++ Programming Language By Bjarne Stroustrup
  - Object-Oriented Software Engineering
    By Jacobson, Christerson, Jonsson, Overgaard
- Tools
  - GCC (GNU C Compiler)
  - Linux (Recommended) / Windows (Not Recomm)

Course Contents

- Object-Orientation
- Objects and Classes
- Overloading
- Inheritance
- Polymorphism
- Generic Programming
- Exception Handling
- Introduction to Design Patterns

Lecture # 1

Introduction to Object Orientation

Non-structured Programming

e.g. Assembly Language, BASIC

```
a 100
mov ax,0002
mov bx,0004
add ax,bx
nop
```

- Advantages
  - Low Level access
  - High Optimization
  - Shorter size programs
- Disadvantages
  - Large programs highly complex
  - Difficult to understand
  - Repetition of code

Procedural/Structured Programming

e.g. C, Pascal

- Advantages
  - Fast execution
  - Small memory footprint (Size)
- Disadvantages
  - Limited in Enhancement over the time
  - Low reusability
  - Difficult to Extended
  - Less Dynamic architecture

Object Oriented Programming

e.g. C++, C#, Java etc

- Disadvantages
  - Little Slow execution
  - Little Big memory footprint (Size)
- Advantages
  - Better Enhancement over the time
  - High reusability
  - Easy to Extended
  - Better representation of real world problems

Today we will learn about Object Orientation technique for solving real world problem.

OBJECT-ORIENTATION (OO)

What is Object-Orientation?

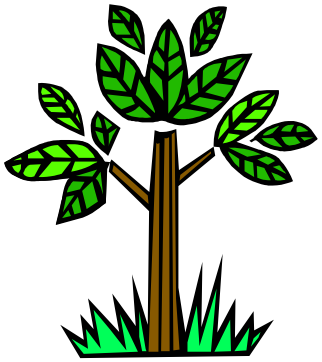
- A technique for system modeling
- OO model consists of several interacting objects

What is a Model?

- A model is an abstraction of something
  - Prototype/Architecture of a building
- Purpose is to understand the product before developing it

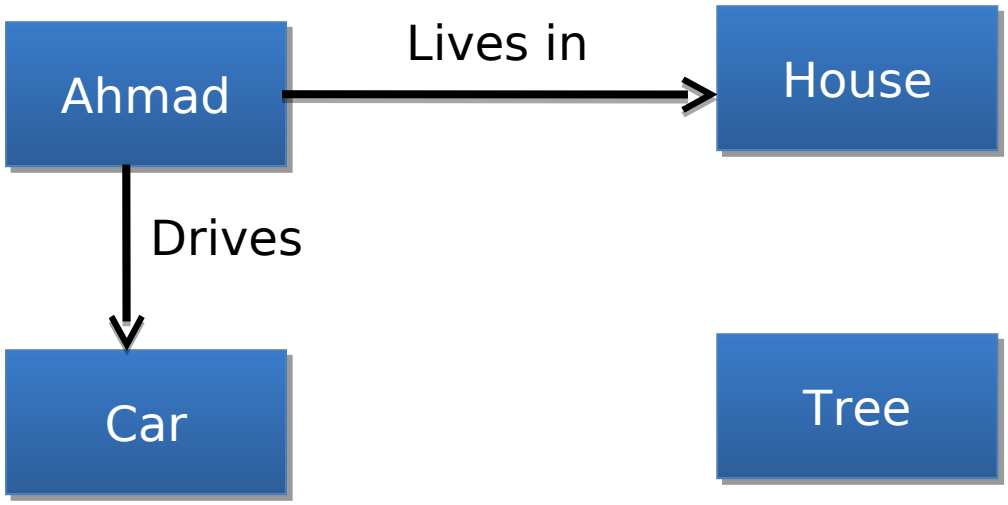
E.g. Highway maps, Architectural models, Mechanical models

Example – OO Model

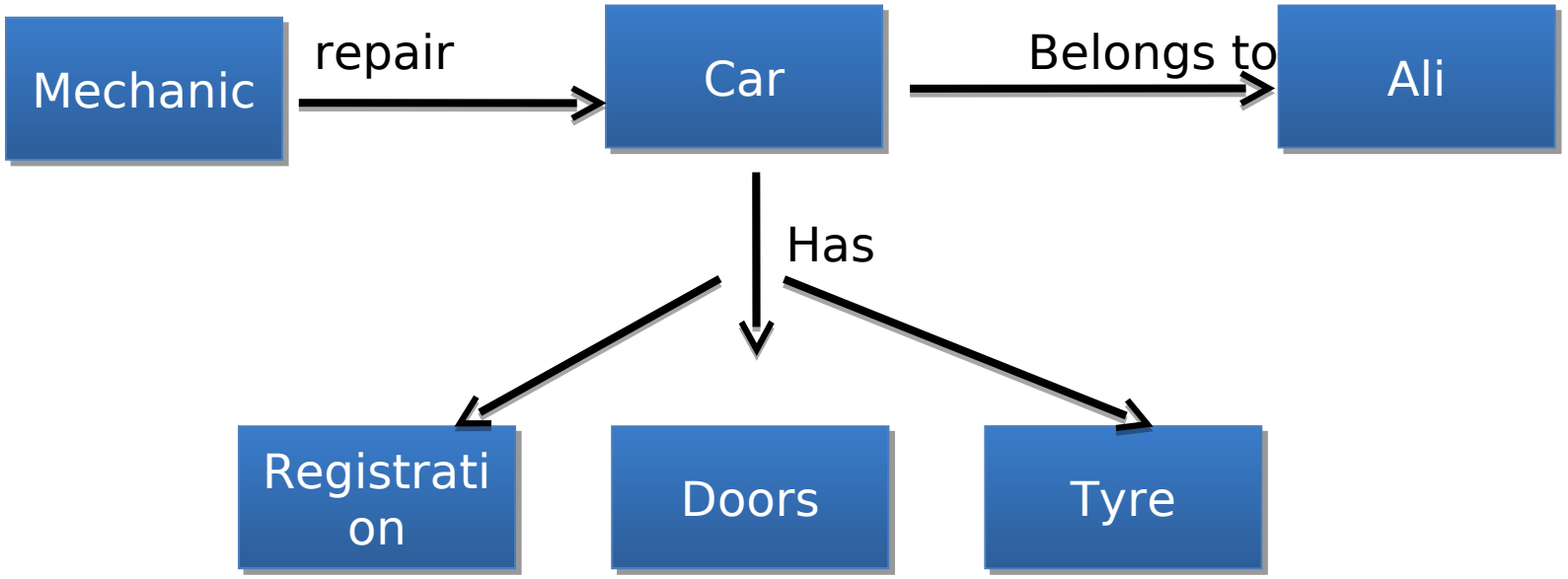


…Example – OO Model

- Objects
  - Ahmad
  - House
  - Car
  - Tree
- Interactions
  - Ahmad lives in the house
  - Ahmad drives the car



…Example 2 – Workshop



- Objects

  Mechanic, Car, Owner, Registration, Doors, Tyre

- Interactions

Repair, Ownership, Registered to, Containment

Object-Orientation - Advantages

- People think in terms of objects
- OO models map to reality
- Therefore, OO models are
  - easy to develop
  - easy to understand

What is an Object?

An object is

- Something tangible (possess physical existence)
  - E.g. Ahmad, Car
- Something that can be apprehended intellectually (Time, Date)
- Nouns

… What is an Object?

An object has

- State (attributes)
- Well-defined behavior (operations)
- Unique identity

Example – Ahmad is a Tangible Object

- State (attributes)
  - Name
  - Age
- behavior (operations)
  - Walks
  - Eats
- Identity
  - His name / NIC Number

Example – Car is a Tangible Object

- State (attributes)
  - Color
  - Model
- behavior (operations)
  - Accelerate
  - Start Car
  - Change Gear
- Identity
  - Its registration number

Example – Time is an Object Apprehended Intellectually

- State (attributes)
  - Hours
  - Minutes
  - Seconds
- behavior (operations)
  - Set Hours
  - Set Minutes
  - Set Seconds
- Identity
  - Would have a unique ID in the model / Date Type

Example – Date is an Object Apprehended Intellectually

- State (attributes)
  - Year
  - Day
  - Month
- behavior (operations)
  - Set Year
  - Set Day
  - Set Month
- Identity
  - Would have a unique ID in the model

Q & A