OBJECT ORIENTED SYSTEMS OF KNOWLEDGE REPRESENTATIONS

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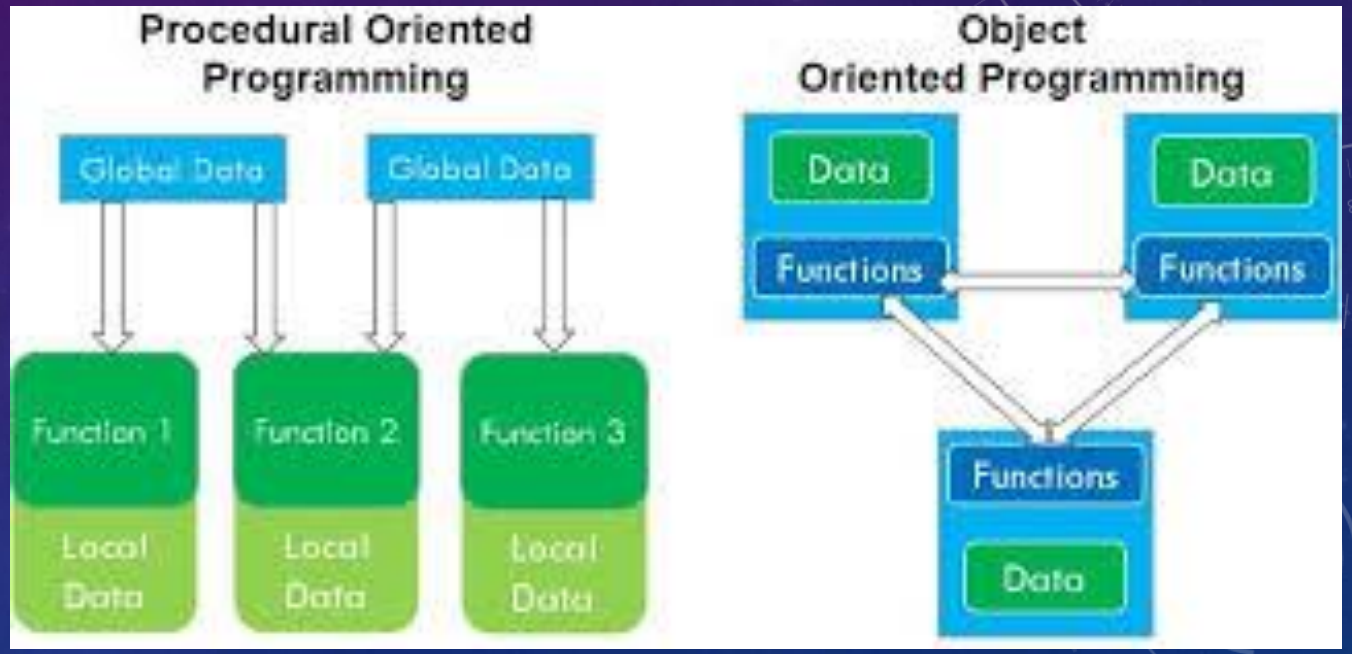
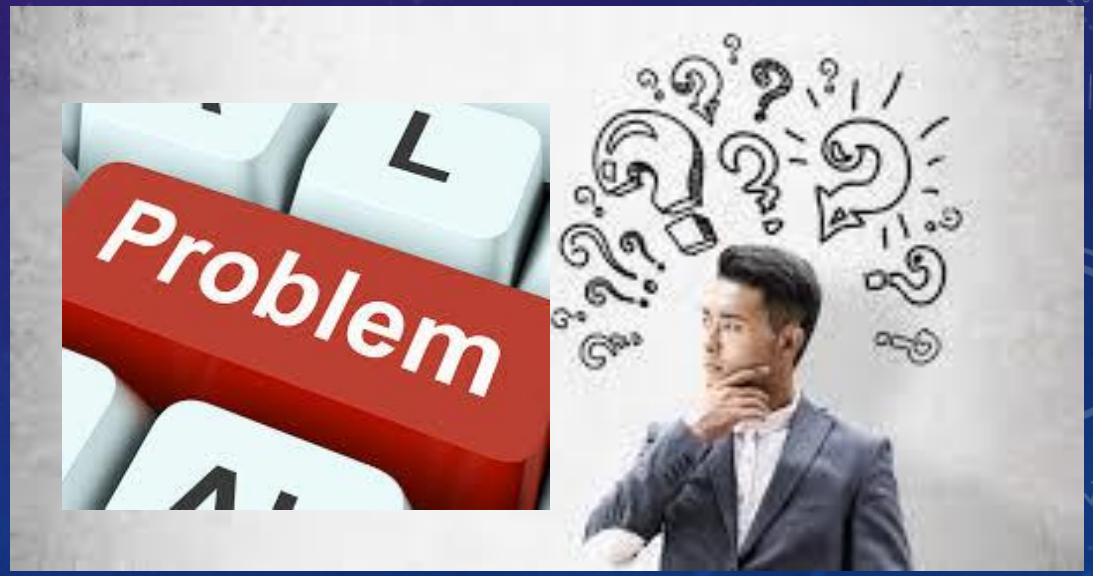
INTRODUCTION

- In procedural programming languages such as Pascal or Fortran, a program consists of a procedural part and a data part
- The procedural part consists of set of program instructions and the data part (the numbers and character strings which are manipulated by instructions)
- Programs typically contain several modules of instructions which perform computations on the same data set



WHAT IS THE PROBLEM?

- When some change is made to the format of the data, every module which uses it must then be modified to accommodate the newly revised format
- This places a heavy burden on the software maintenance process and
- Makes these types of programs more prone to errors



OOS

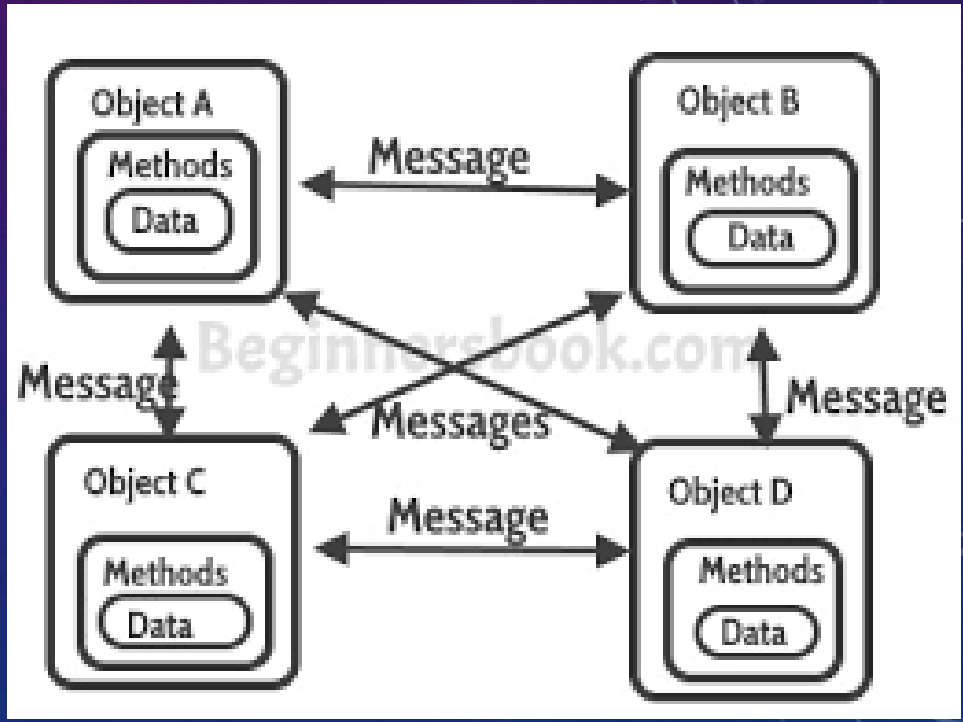
- In an object-oriented system (OOS) the emphasis between data and procedures is reversed
- Data becomes the primary object and procedures are secondary
- It is a well known system design principle used to make systems more modular and robust
- Here, objects are associated with their own procedures and as such are responsible for their own actions
- Thus, when some change is required in the data or procedure, only changed object need be modified
- Other objects are not affected and therefore require no modification
- In object oriented systems there is simplicity in structure because almost everything is an object
- For example, a car can be regarded as an object consisting of many interacting components or sub-objects

- The object paradigm seems to model real-world systems more closely than the procedural programming models where objects (data) and procedures are separated

- In object oriented system objects become individual, self-contained units which exhibit a certain behaviour of their own and interact with other objects only through passing of messages

- Tasks get performed when a message is sent to an object which can perform the task

- All the details are rightfully hidden from other objects, i.e. ensures privacy



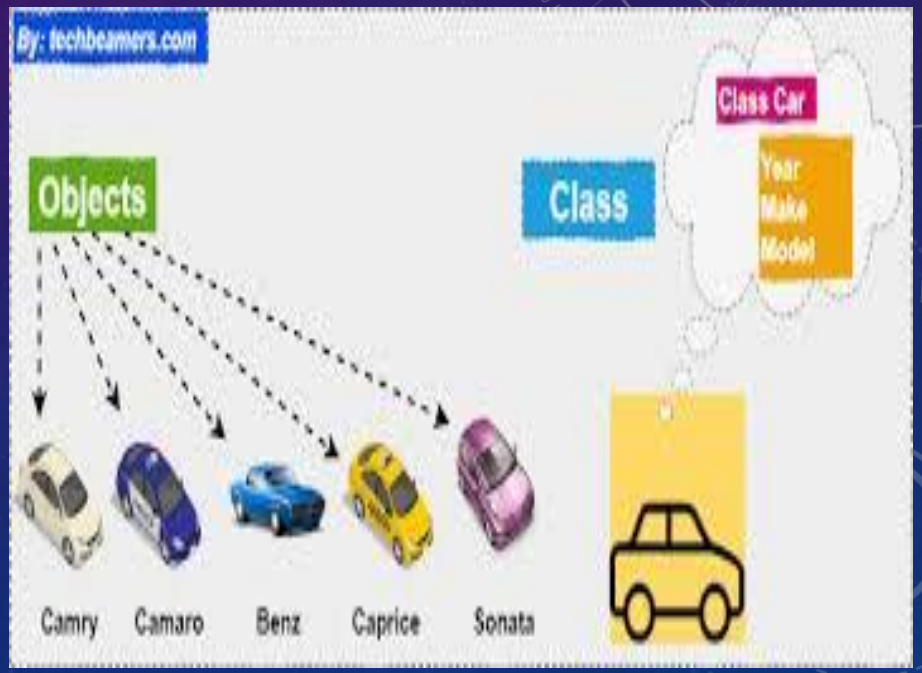
IDEA BEHIND OBJECT ORIENTED SYSTEMS OF KNOWLEDGE REPRESENTATION:

- The basic idea behind an OOS is the notion of classes of objects interacting with each other to accomplish some set of tasks
- The objects have well defined behaviours
- They interact with each other through use of messages
- When a task needs to be performed, an object is passed a message which specifies the task requirements
- The receiving object then takes appropriate action in response to the message and responds by returning a message to the sender
- In performing the required task, the receiver may need assistance from other objects, thereby prompting further messages to be sent
- In general a task may consist of any definable operation

OBJECTS, CLASSES, MESSAGES, METHODS OF OBJECT ORIENTED SYSTEMS:

OBJECTS

- Objects are the basic building blocks in OOS
- All entities except the parts of messages, comments and certain punctuation symbols are objects
- An object consists of a limited amount of memory which contains other objects (data and procedures)
- Objects are characterized by attributes and by the way they behave when messages are sent to them
- All objects belong to some class
- They are created by declaring them as instances of an existing class and instantiating instance variables
- The class to which an object belongs can be determined by sending it the message “Class”



MESSAGES

- Actions are performed in an OOS by sending messages to an object
- This corresponds to a function or procedure call in other languages

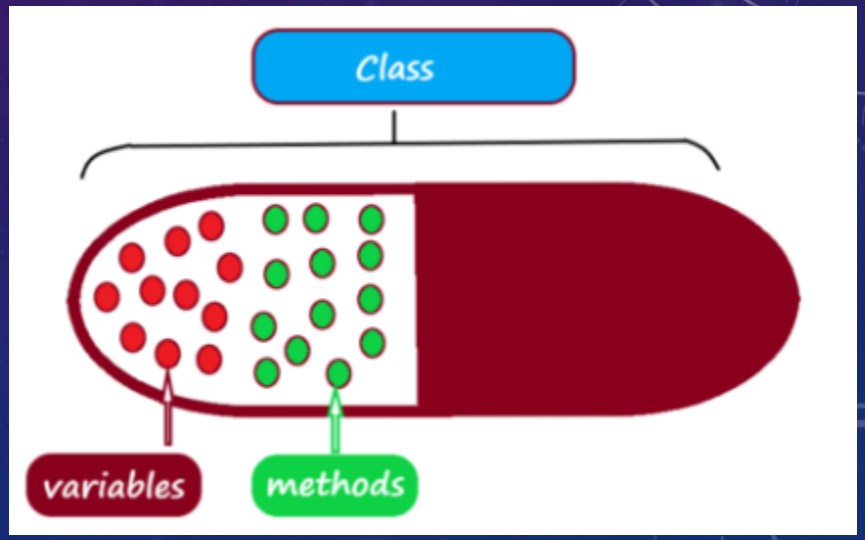
- The messages are formatted strings composed of three parts:
- a receiver object,
- a message selector and
- a sequence of zero or more arguments

- The format of a message is given as:
- <object selector> <args>, <args>

METHODS

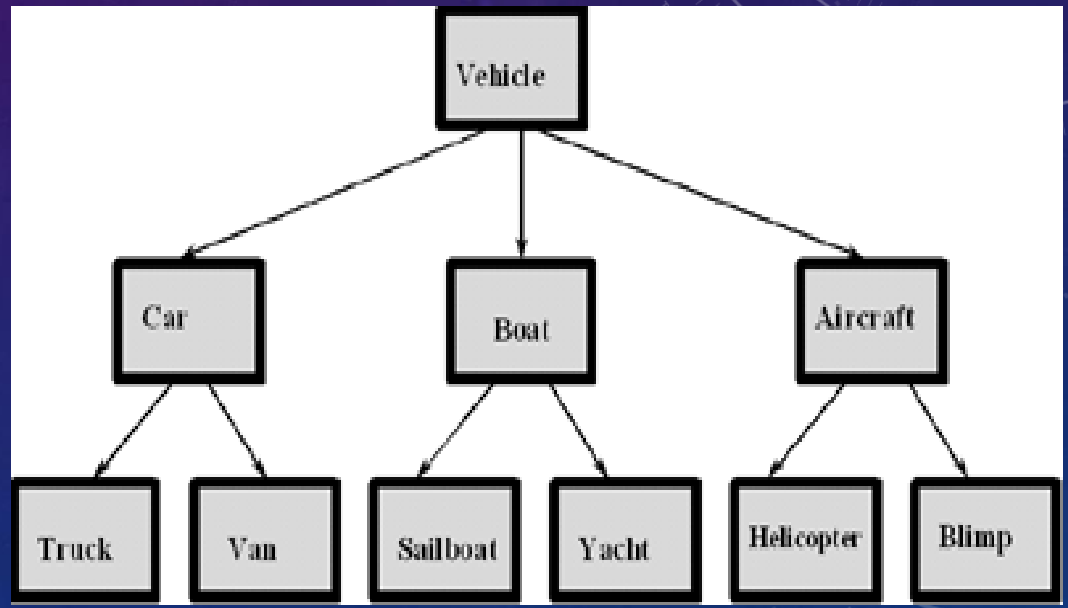
- Procedures are called methods
- They determine the behaviour of an object when a message is sent to an object
- Methods are the algorithms or sequence of instructions executed by an object

- For example
- in order to respond to the message 5+7, the object 5 must initiate a method to find the sum of integer numbers 5 and 7
- On completion of the operation, the method returns the object 12 to the sending object.



CLASSES AND HIERARCHIES

- A class is a general object which defines a set of individual (instance) objects which hare common characteristics
- All objects are instances of some class and classes are sub-classes of some higher class, except for a most general root class
- The root class for an OOS is the class named object.
- When a message is sent to an object, a check is first made to see if the method is for the object itself or its immediate class can perform the required task
- If not, the methods of the nearest superclass are checked
- If they are not adequate, the search process continues up the hierarchy recursively until methods have been found or the end of a chain has been reached
- If the required method is not found, an error message is printed
- This is process of inheritance



- Object oriented systems are useful in modelling many real world situations in which real object can be put in one to one correspondence with program classes and objects
- We may conclude by saying that semantic nets are useful for their applications in monotonic and non-monotonic reasoning
- CDs are more powerful tools for knowledge representation, but have limited use in monotonic systems
- Scripts oriented representation are mainly useful to represent complex scenes, which by other means are too difficult to be realizable

EXAMPLE

- Let for example, we have a robot planning program and we want to know if we move a table into another room, what other objects also change location

- In (Table1, Living room)
- Made-of (Table1, Wood)
- On (Vase1, Table1)
- Made of (Vase1, Glass)
- On (Vase2, Table2)
- On (Lamp1, Table1)

- (Living room1:
  - Contains:
    - (Table 1:
      - Made of: Wood
      - Has-on: (Vase1:
        - Made of: Glass)
      - (Lamp1: …))
    - (Table 2:
      - Has-on: (Vase 2:…)))


Thank
You
Obrigado
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Kiitos
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Vinaka
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