

Report on Object Oriented Programming

Submitted By

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Introduction

When we are just starting off with our programming journey, the very first concept taught to us is flowcharts and how a computer program executes in a top-down manner. We are taught that by writing code we are instructing computers on how to finish a task step by step. The paradigm is called procedural programming, and it uses a top-down approach. Basically, procedural programming involves dividing the program into various procedures/functions/routines. While procedural programming is an excellent choice for general purpose programming, it comes with the added disadvantage of non-reusable code, and the data is exposed to the whole program making it vulnerable in terms of security aspects.

To solve the drawbacks of Procedural programming we have object-oriented programming. In object-oriented programming, everything is viewed in terms of classes and objects. The software program is structured into simple and reusable pieces of code. OOPs is one of the widely used programming paradigms adopted by software developers. In this report, we will look at some of the applications of OOPs in the real world. Before moving to the applications, it is essential to have a clear understanding of OOPs.

What is OOP

Object-Oriented Programming (OOP) is a programming paradigm that relies on the concept of classes and objects. It is used to structure a software program into simple, reusable pieces of code blueprints (usually called classes), which are used to create individual instances of objects. There are many concepts of OOPs such as inheritance, data binding, polymorphism, etc. The programming paradigm where everything is represented as an object is known as a truly object-oriented programming language. Smalltalk is considered the first truly object-oriented programming language.

- **Objects:** Any entity that has a state and behavior is known as an object, for example, tables, pen, etc. It can be defined as an instance of class; it contains an address and takes up some space in memory. They can

communicate with each other without knowing the details of each other's data or code.

- **Class:** Collection of multiple objects is called class; it is a blueprint from which you can create an individual object. They represent broad categories that share attributes.
- **Inheritance:** When one class acquires all the properties and behaviors of a parent object, it is known as inheritance. It provides code reusability.
- **Polymorphism:** Polymorphism means having many forms, it is the ability of an object to take on many forms.
- **Abstraction:** It is the property by virtue of which only the essential details are displayed to the user, the non-essential details are hidden from the end users.
- **Encapsulation:** It is defined as the wrapping up of data under a single unit. It is the mechanism that binds together code and the data it manipulates.

There are many advantages of OOPs like reusability, data redundancy, code maintenance, security, better productivity, and design benefits.

Application of OOPs

Now we have a basic idea of what object-oriented programming means, now let's look at some of the applications of OOPs.

Real Time Systems

The term "real-time system" refers to any information processing system with hardware and software components that perform real-time application functions and can respond to events within predictable and specific time constraints. For real-time computing, timeliness and time synchronization are the two requirements. Timeliness means the ability to produce the expected result by a specific deadline and time synchronization means the capability of agents to coordinate independent clocks and operate together in unison. Using object-oriented technology, we can develop real-time systems, this will offer adaptability, ease of modifications, reusability for the code. There is a lot of

complexity involved in designing real-time systems, OOP techniques make it easier to handle those complexities.

Client Server System

The client-server systems are those that involve a relationship between cooperating programs in an application. In general, the clients will initiate requests for services and the servers will provide that functionality. The client and server either reside in the same system or communicate with each other through a computer network or the internet.

The concepts of OOPs are quite useful when designing client-server systems. Object-oriented client-server systems are used to provide the IT infrastructure that creates Object-oriented server internet or the OCSI applications. The infrastructure refers to the operating systems, networks, and hardware.

OCSI contains the following main technologies

- The Client Server
- Object Oriented Programming
- The Internet

Hypertext and Hypermedia

Hypertext is non-linear, multi-sequential, a cross-referencing tool that connects the links to other texts, Example of hypertext is that InterviewBit, when we read one article it uses hypertext to link other pages and when we click on that hypertext it takes us to that page so that we can gather more information related to the topic. Hypermedia is the extension to hypertext including multiple forms of media like graphics, text, audio, and video, etc. An example of hypermedia is that when we use an e-commerce site say Amazon and when we click on any product page which belongs to that. So here the link is embedded in the image. OOP also helps in laying the framework for hypertext and hypermedia.

Object Oriented Database

Nowadays each data is being stored and processed, the traditional model of storing data i.e. the relational model stores each piece of data in tables that

consist of rows and columns. However, as complexity grows, storing in the form of tables becomes quite cumbersome, here the need for storing in the form of real-world objects comes into the picture. These databases try to maintain a direct correspondence between the real-world and database objects to let the object retain its identity and integrity. They can then be identified and operated upon.

MongoDB is a popular example of object-oriented database.

Neural Networks and Parallel Programming

A neural network is a series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates. In this sense, neural networks refer to systems of neurons, either organic or artificial in nature.

Parallel programming involves the division of a problem into smaller subproblems, the subproblems can be executed at the same time using multiple computing resources. OOPs are used to simplify the process by simplifying the approximation and prediction ability of the network.

AI Expert Systems

An AI expert system is the one that simulates the decision-making ability of a human expert, the expert knowledge can be increased using different add-ons to the knowledge base or in simple words the addition of rules. For example, PXDES is an expert system that predicts the degree and type of lung cancer. There are many expert systems out there.

OOPs, power the development of such AI expert systems, to AI systems use forward and backward chaining to reach a conclusion. Basically, the chaining involves a chain of conditions and derivations to deduce the outcome. An AI system has to be reliable, highly responsive, and offer high performance, to power such capabilities OOPs are used.