

Programming Applications and Frameworks

Declarative and Imperative paradigms.

Declarative Programming	Imperative Programming
Declarative paradigm is describe what the problem is	Imperative paradigm is describe how to solve the problem
program has a set of statements	program has a sequence of commands
examples: PROLOG , ASP	examples : JAVA , C

Procedural programming and Functional programming

Procedural programming and functional programming, both have 'procedures' that can be called from elsewhere in the program. When we compare procedural programming and functional programming, procedural programming performs a series of sequence steps and everything done in a specific order. But in functional programming order of evaluation is usually undefined. languages are immutable. Procedural languages are generally mutable and most of functional

Lambda calculus and Lambda expressions in functional programming

lambda calculus is a formal system in mathematical logic for expressing computation based on function abstraction and application using variable binding and substitution, it is a universal model of computation that can be used to simulate any Turing machine.

A lambda calculus expression is defined as

```
e ::= x variable
    | λx.e function
    | e e function application

( λx . xy ( λy . + y ) ) x
```

“no side-effects” and “referential transparency” in functional programming

A function or expression is said to have a side effect if it modifies some state outside its local environment, that is to say has an observable interaction with the outside world besides returning a value. In functional programming, side effects are rarely used. Therefore we can say there is "no side effects" in functional programming.

"Referential transparency" is an expression is called referentially transparent if it can be replaced with its corresponding value without changing the program's behavior.

"No side effect" = "Referential transparency"

Key Features of Object Oriented Programming

Instances of classes, which we can use to store data and perform actions.

Objects has the same structure of the class. **Classes :**

Abstract definition of the data type. It includes the data element that are part of the data type, and the operations which are define on the data data type.

Abstraction :

Process of indicating important things to user and hide the internal details.

Encapsulation :

Process of binding the data and methods together as a single unit.

Inheritance

It is a mechanism where can derive a class from another class for a hierarchy of classes that share a set of attribute and methods. **Polymorphism :** Is ability to process objects differently depending on their data type or class. There are two types of Polymorphism

- 1) Method overloading
- 2) Method Overriding

event-driven programming is different from other programming paradigms

Event - Drive programming is a programming paradigm in which the flow of program execution is determine by events.

Event - Drive programming is an approach rather than a type of programming language, it can be practiced with any programming language.

Compiled languages, Scripting languages, and Markup languages

Compiled languages

Some executables can be directly run on the OS (C on Windows). Some executables use virtual runtime machines

E.g. (JAVA, .NET).

Scripting languages

Source code is not compiled, it is directly executed. At the execution time, the code is interpreted by a runtime machine

E.g. PHP, JS

Markup languages

There is no execution process for the markup languages. The tools who have the knowledge to understand the markup languages can render(generate) the output.

E.g. HTML, XML

Role of the virtual runtime machines

Virtual machine(JVM) and runtime environment(JRE) are different concept. The java runtime consist of the virtual and standard

library and JRE is the implementation of JVM. JVM is a virtual machine that provide execution of

java program as well as programs with other languages.

Find how the JS code is executed (What is the runtime? where do you find the interpreter?)

JavaScript is dependent following computes working together to pass and order information

- The call stack

- The event loop

- The task queue

- Web APIs/extended resources

All the global code are executed inside the global execution context. Java interpreter goes through the code twice. The first run through the code is where it does a safety check.

Output of an HTML document is rendered, indicating the tools used to display the output.

The <title> element is a required HTML element used to assign a title to an HTML document. HTML comments are visible to anyone that views the page source code, but are not rendered when the HTML document is rendered by a browser

Identify different types of CASE tools, Workbenches, and Environments for different types of software systems (web-based systems, mobile systems, IoT systems, etc.)

Computer Aided Software Engineering (CASE) tools are used throughout the engineering life cycle of the software systems

CASE software types

Individual tools - for specific task

Workbenches - multiple tools are combined, focusing on specific part of SDLC

Environments - combines many tools to support many activities throughout the SDLC

Framework, Library, and Plugin

Plugins

Plugins provide specific tools for development

At development time

The plugin (source code files, modules, packages, executables, etc.) is placed in the project, Apply some configurations using code

At runtime

The plug-in will be invoked via the configurations

Libraries

Libraries provide an API, the coder can use it to develop some features, when writing code

At development time

Add the library to the project (source code files, modules, packages, executables, etc.)

Call the necessary functions/methods using the given packages/module/classes

At runtime

The library will be called by the code.

Framework

Framework is a collection of libraries, tools, rules structures, and control, to build software systems

At development time

Create the structure of the application

Place your code in necessary places

You may use the given libraries to write your code

You can include additional libraries and plugins

At runtime

The framework will call your code (inverse of control)
