# **Programming Paradigms**

**In this article we're going to take a look at programming paradigms.**

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**Introduction to Programming Paradigms:**

* Programming paradigms are different ways or styles in which a given program or programming language can be organized. Each paradigm consists of certain structures, features, and opinions about how common programming problems should be tackled.
* The question of why are there many different programming paradigms is similar to why are there many programming languages. Certain paradigms are better suited for certain types of problems, so it makes sense to use different paradigms for different kinds of projects.
* Also, the practices that make up each paradigm have developed through time. Thanks to the advances both in software and hardware, different approaches have come up that didn't exist before.

**Popular Programming Paradigms**:

* Imperative programming
* Procedural programming
* Functional programming
* Object-oriented programming
* Imperative Programming:
* Imperative programming consists of sets of detailed instructions that are given to the computer to execute in a given order. It's called "imperative" because as programmers we dictate exactly what the computer has to do, in a very specific way.
* Imperative programming focuses on describing *how* a program operates, step by step.
* Procedural programming:
* Procedural programming is a derivation of imperative programming, adding to it the feature of functions.
* In procedural programming, the user is encouraged to subdivide the program execution into functions, as a way of improving modularity and organization.
* Functional programming:
* In functional programming, functions are treated as **first-class citizens**, meaning that they can be assigned to variables, passed as arguments, and returned from other functions.
* Another key concept is the idea of **pure functions**. A **pure** function is one that relies only on its inputs to generate its result. And given the same input, it will always produce the same result. Besides, it produces no side effects
* Object-oriented programming:
* The core concept of OOP is to separate concerns into entities which are coded as objects. Each entity will group a given set of information (properties) and actions (methods) that can be performed by the entity.
* OOP makes heavy usage of classes (which are a way of creating new objects starting out from a blueprint or boilerplate that the programmer sets). Objects that are created from a class are called instances.
* Inheritance is the key principle of Object-Oriented Programming

**Advantages and Disadvantages of Programming Paradigms:**

* **Advantages:**
* Simple and straightforward: Procedural programming is easy to learn and understand, making it an ideal choice for beginners.
* Well-established: With a long history of use, procedural programming is a well-established paradigm that has been widely adopted in many areas of software development.
* - Efficient: Procedural programming can be more efficient than other paradigms, as it requires less overhead and provides a more direct approach to problem-solving.
* Declarative Programming focuses on describing the desired result without specifying the step-by-step procedure
* **Disadvantages:**
* Limited scalability: As projects become more complex, procedural programming can become difficult to maintain and scale.
* - Lack of reusability: Reusing code is more difficult in procedural programming, as it requires writing more code to support different use cases.
* - Poor object-oriented features: Procedural programming lacks the object-oriented features that are needed for building complex, scalable systems.

**Conclusion:**

* programming paradigms are different ways in which we can face programming problems, and organize our code.
* Imperative, procedural, functional, declarative, and object oriented paradigms are some of the most popular and widely used paradigms today. And knowing the basics about them is good for general knowledge and also for better understanding other topics of the coding world.

**Test Your Knowledge:**

**1)Which programming paradigm focuses on describing the desired result without specifying the step-by-step procedure?**

* **a) Declarative**
* **b) Imperative**
* **c) Event-Driven**
* **d) Procedural**

**2)Which programming paradigm focuses on changing the program's state through a series of statements?**

* **a) Imperative..**
* **b) Functional**
* **c) Object-Oriented**
* **d) Declarative**

**3)What is a key principle of Object-Oriented Programming (OOP)?**

* **a) Immutability**
* **b) Inheritance..**
* **c) Avoiding functions**
* **d) Global variables**

**Answers:**

* **1)Declarative**
* **2)Imperative**
* **3)Inheritance**