Programming Paradigms

Imperative – How to solve

* Procedural
* Object-oriented

Declarative – What to solve

* Functional
* Logic

Functional Programming

The design of the functional languages is based on mathematical functions while  
the design of the imperative languages is based on von Neumann architecture

Backus proposed functional programming in his Turing Award Lecture in 1978

The programs written with functional programming language are more readable, more reliable, and more likely to be correct.

Purely functional programs are easier to understand during and after development

Von Neumann architecture diagram:

Diagram

Description automatically generated

Program ve veri memory’de. Instructionlar memory’de, CPU’ya gönderiliyor, orada çalıştırılıyor, tekrar sonuç memory’ye yazılıyor.

Mathematical Functions

A mathematical function is a mapping of members of one set, called the domain set, to another set, called the range set

A picture containing text, clock

Description automatically generatedFonksiyon nasıl mapleyeceğimizi söyler.

Fundamentals of Functional Programming Languages

* Pure functions
  + Aynı inputu verdiğimizde output hep aynı olmalı, side effect yok, assignment yok, memory’de bir yeri değiştirmiyor
* Recursion
  + Fonksiyonel programlamada loop yok
* Referential Transparency
  + Lisp’in ilk versiyonunda geçerlidir. İlk değişkene bir değer atandığında program çalışması boyunca değer değişmez.
* Functions are First-Class and can be Higher-Order
  + Fonksiyonlar variable gibidir, birbirlerine parametre olarak geçebilir, birbirlerini return edebilir
  + Higher-order: fonksiyon parametre alıp başka fonksiyon return eden fonksiyonlar
* Variables are immutable

First and Most Popular Functional Programming Language: LISP

Oldest and most widely used functional programming language

Developed by John McCarthy at MIT in 1959

Except first version all Lisp dialects include imperative-language features, such as imperative-style variables, assignment statements, and iteration

Common Lisp was created in an effort to combine the features of several early 1980s dialects of Lisp into a single language