Assignment 1: Write on 5 different paradigms of programming

A paradigm can also be termed as a method to solve a problem or accomplish a task. A programming paradigm is an approach to solving a problem using a specific programming language. In other words, it is a methodology for problem-solving using the tools and techniques available to us, following a particular approach. While there are many programming languages, each of them typically adheres to one or more paradigms that guide how the language is implemented.

These methodologies or strategies are referred to as programming paradigms. Apart from the variety of programming languages available, there are several paradigms that address different demands and challenges in software development. These paradigms are discussed below:

Imperative programming paradigm: It is one of the oldest programming paradigm. It features close relation to machine architecture. It is based on Von Neumann architecture. It works by changing the program state through assignment statements. It performs step by step task by changing state. The main focus is on how to achieve the goal. The paradigm consist of several statements and after execution of all the result is stored.

Advantages:
1. Very simple to implement
2. It contains loops, variables etc.

Disadvantages:
1. Complex problem cannot be solved
2. Less efficient and less productive
3. Parallel programming is not possible

Examples of Imperative programming paradigm:

C : developed by Dennis Ritchie and Ken Thompson

Fortran : developed by John Backus for IBM

Basic : developed by John G Kemeny and Thomas E Kurtz

Imperative programming is divided into three broad categories: Procedural, OOP and parallel processing. These paradigms are as follows:

- **Procedural programming paradigm -**

  This paradigm emphasizes on procedure in terms of underlying machine model. There is no difference in between procedural and imperative approach. It has the ability to reuse the code and it was boon at that time when it was in use because of its reusability.

Examples of Procedural programming paradigm:

C : developed by Dennis Ritchie and Ken Thompson

C++ : developed by Bjarne Stroustrup

Java : developed by James Gosling at Sun Microsystems

ColdFusion : developed by J J Allaire

Pascal : developed by Niklaus Wirth

- **Object oriented programming -**

  The program is written as a collection of classes and object which are meant for communication. The smallest and basic entity is object and all kind of computation is performed on the objects only. More emphasis is on data rather procedure. It can handle almost all kind of real life problems which are today in scenario.

Advantages:

- Data security
- Inheritance
- Code reusability
- Flexible and abstraction is also present

Examples of Object Oriented programming paradigm:

Simula : first OOP language

Java : developed by James Gosling at Sun Microsystems

C++ : developed by Bjarne Stroustrup

Objective-C : designed by Brad Cox

Visual Basic .NET : developed by Microsoft

Python : developed by Guido van Rossum

Ruby : developed by Yukihiro Matsumoto

Smalltalk : developed by Alan Kay, Dan Ingalls, Adele Goldberg

- Parallel processing approach -

  Parallel processing is the processing of program instructions by dividing them among multiple processors. A parallel processing system posses many numbers of processor with the objective of running a program in less time by dividing them. This approach seems to be like divide and conquer. Examples are NESL (one of the oldest one) and C/C++ also supports because of some library function.

2. Declarative programming paradigm:

It is divided as Logic, Functional, Database. In computer science the declarative programming is a style of building programs that expresses logic of computation without talking about its control flow. It often considers programs as theories of some logic.It may simplify writing parallel programs. The focus is on what needs to be done rather how it should be done basically emphasize on what code is actually doing. It just declares the result we want rather how it has be produced. This is the only difference between imperative (how to do) and declarative (what to do) programming paradigms. Getting into deeper we would see logic, functional and database.

- **Logic programming paradigms -**

  It can be termed as abstract model of computation. It would solve logical problems like puzzles, series etc. In logic programming we have a knowledge base which we know before and along with the question and knowledge base which is given to machine, it produces result. In normal programming languages, such concept of knowledge base is not available but while using the concept of artificial intelligence, machine learning we have some models like Perception model which is using the same mechanism.

In logical programming the main emphasize is on knowledge base and the problem. The execution of the program is very much like proof of mathematical statement, e.g., Prolog

- **Functional programming paradigms -**
  The functional programming paradigms has its roots in mathematics and it is language independent. The key principle of this paradigms is the execution of series of mathematical functions. The central model for the abstraction is the function which are meant for some specific computation and not the data structure. Data are loosely coupled to functions.The function hide their implementation. Function can be replaced with their values without changing the meaning of the program. Some of the languages like perl, javascript mostly uses this paradigm.

Examples of Functional programming paradigm:

JavaScript : developed by Brendan Eich

Haskell : developed by Lennart Augustsson, Dave Barton

Scala : developed by Martin Odersky

Erlang : developed by Joe Armstrong, Robert Virding

Lisp : developed by John Mccarthy

ML : developed by Robin Milner

Clojure : developed by Rich Hickey

Database/Data driven programming approach -

This programming methodology is based on data and its movement. Program statements are defined by data rather than hard-coding a series of steps. A database program is the heart of a business information system and provides file creation, data entry, update, query and reporting functions. There are several programming languages that are developed mostly for database application. For example SQL. It is applied to streams of structured data, for filtering, transforming, aggregating (such as computing statistics), or calling other programs. So it has its own wide application.

Reference: https://www.geeksforgeeks.org/introduction-of-programming-paradigms/