LUT Computational Engineering   2022-04-06

BM40A0202 Foundations of Computer Science
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Exercise 12 (week 15): Programming paradigms and computational science.

Tasks (1 p/task)

1. a) First generation of programming languages were machine languages. What have been the distinctive features in following generations (aka. the "big leap" that justifies the new generation)? Give an example language of each generation.

   b) What are the differences between imperative, object-oriented and declarative programming?

2. Some programming languages support multiple programming paradigms, while others are best suited to programming mainly according to a particular paradigm. Find out to which paradigm(s) the following programming languages "belong."

C	Java	Matlab	C++	Prolog	Python	Rust
Lisp	R	Perl	SQL	JavaScript	PHP	C#

3. Explain (briefly) the differences of following mathematical models:

   a) Linear vs. nonlinear

   b) Static vs. dynamic

   c) Deterministic vs. stochastic

4. Music pieces often have repeated structures, and instructions for playing/singing a song can be thought of a program. Write an imperative program for playing/singing through Iron Maiden's song "Running Free" (can be found from YouTube/Spotify/your choice of music service) in pseudocode. Give the modules of the song some names (example: intro, verse1, verse2, chorus,...) and use a loop structure to specify the number of repetitions of these modules each time. (Note: you don't need to be musically gifted at all to complete this task – just listen and use your ears as a judge of what is "a repetition". But if you are, you can also specify to which musician you've written the program; for example, the guitar parts may slightly change in some repetitions, while the bass/drums/vocal parts may not. So, the programs for different instrument players will look slightly different. If you're not musically inclined, you can ignore this.)