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CS 472 HW 1

(1.3) We said that the pattern of 1s and 0s used to represent an instruction in a computer has no intrinsic meaning. Why is this so and what is the implication of this statement?

- This is so because the base 2 numbering system is something created by humans, and thus has no meaning in the physical world. Because of this, it is up to whoever designs the hardware to determine which combinations of bits correspond to which instructions. The implication here is that the creator of the hardware and instructions ultimately determines the meaning behind those bits, and that one designer's bits will not mean the same thing as another designer's bits.

(1.5) Modify the algorithm used in this chapter to locate the longest run of non-consecutive characters in the string.

- The new algorithm is fairly similar. The differences are as follows:
    - The 'if' statement checks if the new digit is different instead of the same
    - The 'then' statement updates the current run value to the new digit value

(1.8) What are the differences between RTL, machine language, assembly language, high-level language, and pseudocode?

  - RTL (Register Transfer Language) shows the flow of data between hardware registers. It is an abstract representation of how the states and contents of hardware registers change as an instruction is being executed.
  - Machine code is binary. The 1s and 0s represent transistor states, 1 being the 'on' (or conducting) state and 0 being the 'off' (or non conducting) state. This is the lowest level on this list.
  - Assembly is a language that provides a level of abstraction on top of machine language. Each command in assembly directly translates to a specific machine language binary pattern, but is much more easily understood by humans.
  - High level language is any language that can be written for general use and compiled to run on a specific hardware using a compiler that provides instructions for translating the high level code to machine language for the hardware. Examples of this are C and C++.
  - Pseudocode is not a language, but an abstraction of computing language in the general sense. It is simply a description of an algorithm that uses general terms to describe the control flow. These general terms can be applied to any language.

(1.12) What is the difference between a computer's *architecture* and its *organization*?

(1.18) What is the von Neumann bottleneck?

(1.33) Is Moore's law a law?