Philip Lenox, Devlin Junker
October 7, 2013
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?

The pattern of 1s and 0s has no intrinsic meaning because us, as programmers and CPU designers, decide what instructions the computer will perform based on a given pattern. The implication of this, is that we can create and model anything that can be represented quantitatively.

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

```
1. Read the first digit in the string and call it new_digit
2. Set the current_run_value to new_digit
3. Set the current_run_length to 1
4. Set the max_run to 1
5. REPEAT
6. Read the next digit in the sequence (i.e. read new_digit)
7. IF its value is not the same as current_run_value
8. THEN current_run_length = current_run_length +1 current_run_value = new_digit
10. ELSE current_run_length = 1
11. IF current_run_length ¿ max_run
12. THEN max_run = current_run_length
13. UNTIL The last digit is read
```

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

RTL, or register transfer language, is a way of symbolically representing operation in a computer in a specific way to make clear memory accesses, data movement.

Machine language is the binary sequence that is fetched and executed by the processor. This is the lowest level a computer program is converted to.

Assembly language is the symbolic representation of machine code that make it human readable. Opcodes are replaced by a string of characters representing the operation, and memory location may be refered to symbolically rather than directly. Assembly code must be assembled to be converted to machine code.

High-level language refers to any programming language that is higher level than assembly. Patterns of assembly are refered to in a form more easily human readable. This includes easier to read conditional statements, pre-defined data types, and more sophisticated operation not supported intrinsically by the hardware. High level languages must be compiled in order to be converted to machine language.

Psuedocode consists of the highest level ideas of a program's structure. This ”code” cannot be converted to machine code as it does not follow a specific syntax, and may leave many of the details of the implementation of the code out. It is useful to write psuecode as an outline for the actual code.

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

A computer's *architecture* refers to the ISA, the part of the computer visible to the computer's programmer. Architecture is conserned only with the outward appearance of the computer, and not with how it is implemented in hardware. The instructions that a computer can execute and the data those instructions can be executed on make up the computer architecture.

A computer *organization* refers to the hardware implementation of the architecture. The organization is concerned with the size of data buses, registers, pipelines, data and control hazards, etc.

(1.18) What is the von Neumann bottleneck?

The von Neumann bottleneck refers to the limitation of a computer's processor to access memory due to the disparity in speed between the CPU and memory. As the processor increases in speed, the bottleneck becomes accessing the data stored in the memory.

(1.33) Is Moore's law a law?

Moore's law is not really a law, as it is not a statement that can be rigorously tested through repeated experiments. Moore's law is more of an observation about trends in computing technology.