HNRS 2200

COGITATIONS ON COMPUTATION

Honors Nature of Science, Technology, & Mathematics

Spring 2021

Assignment 0506

This assignment seeks to reinforce what we have covered in the latter of part of the semester regarding the "nuts and bolts" of current computing devices. The overall theme here is to see how the computers we use today actually have more in common than they have that's different. They represent data in the same way and their core components are the same, even if they might look or feel very different.

Due to the subject matter, these technical assignments don't really involve programming, but they do aim to have you demonstrate your understanding of what's going on within computers today.

Background Reading/Viewing

This batch of technical tasks relies mainly on the links/videos provided on the course website for this topic. Some class recordings may also be worth a review, particularly with areas that benefit from some practice.

The OS section will also require a certain degree of web search—that's by design. This will expose you to specific terminology for the various system components and characteristics involved.

What to Do: "Hex's & OS"

True to the binary perspective we have taken in these last few weeks of the semester, this assignment comes in two parts, each with two variations. The variants aren't *too* different from each other but they have slightly different slants. You're asked to pick one task from each part, for a total of two deliverables overall.

Hex's Option 1: Article Encoding

Pick a written piece of your choosing that has a combination of at least ten (10) proper names and numbers. Translate these names and numbers into hexadecimal—names according to their hexadecimal code points (including upper/lowercase) and numbers by converting to base 16 (or base 2 then grouping by nybbles). Treat non-integers as two parts—just convert the values to the left and to the right of the decimal point separately.

Deliverables:

- The original piece (for reference)
- Your "encoded" version
- If applicable, any scratch or written work to show how you did the conversions

Hex's Option 2: File Decoding

Locate a technical specification for a well-known file format like GIF, PNG, etc. (Wikipedia is actually a pretty good source here) and look for its "header" (metadata) portion. File headers are typically described in terms of bits/bytes, denoting their meanings.

Armed with that information, locate a file in that format, "dump" its content as hexadecimal—there are many free utilities that can do so—and "decode" the specific data in that file. Show how you read those off (e.g., the width/height of the image) then verify that you read it right by using another application that shows you the file's data. It's like being a codebreaker!

Deliverables:

- Link to the specification (for reference)
- The file that you "decoded"
- Document showing the data in that file as hexadecimal, alongside your "translation" of that data based on the specification
- Document/screenshots showing independent verification (i.e., from other apps or utilities) that you decided the data correctly

OS Option 1: Computer "Comps"

For this one, you'll need to identify a classmate who (a) also wants to do this option and (b) uses a different operating system from your own. Coordinate things so you can compare what you see on your respective systems.

Choose five (5) or more of the following aspects of your computers and find the app/window that displays information about them. The "comp" part is that your colleague should look for the same aspects on their device—that way you'll see what's the same or different about these systems.

Options include:

- CPU (type, frequency, number of cores, current usage, etc.)
- Main memory (total amount, current usage, etc.)
- Storage devices (type, capacity, etc.)
- Input devices (type, connection, etc.)
- Output devices (type, connection, etc.)
- Network connections (type, status, etc.)
- The list of running processes (visible or not)—IDs, names, users, etc.

Some of these items can all be found in the same place, which is all the better. The "etc." appears a lot because as much detail as possible is desirable but may understandably vary from device to device. Just report as much as you can find.

Deliverables:

(each student should submit the same item individually, with the understanding that they took care of the portions for their system)

- Document showing a side-by-side comparison of how each type of information is reported or displayed on your respective computers—the hope is that, in the end, you'll realize that the differences between your machines are only skin-deep
- There should be a total of five (5) or more "comps" in the document
- If applicable, list of references/sources/websites that you consulted in order to find the information in your comps

OS Option 2: Computer Twin "Peeks"

This option allows you to channel your inner Ally Sheedy or Matthew Broderick, *Wargames*-style, to explore the command-line underbelly of your computer. Using the command-line application on your computer (e.g., Terminal on macOS; Command Prompt or PowerShell on Windows), investigate and execute commands that display the following sets of information. Provide a screenshot of your own execution of those commands side-by-side with how that information is presented normally (i.e., via the graphical user interface of your device):

- List of files in a particular folder
- Operating system version and other "system property"-type information
- Storage devices (type, capacity, etc.)
- Network connections (type, status, etc.)
- The list of running processes (visible or not)—IDs, names, users, etc.

This option expects you to exercise your web search skills to figure out what these commands are for your system, and possibly also where these can be found at the regular user interface level. Don't hesitate to check with me if you get stuck.

Deliverables:

- Document showing the side-by-side equivalents for each type of interface, for each type of information listed
- If applicable, list of references/sources/websites that you consulted in order to find the necessary commands/applications that you used

What to Submit

Each part has a corresponding submission area in Brightspace—upload the respective deliverables there, depending on your chosen variant.