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Prof. Md Ali

CIS 103 - Introduction to Programming

Written Assignment 4: Research and Writing Assignment

1. The Importance of Code Semantics in Programming: Research and explain why coding semantics are critical in programming. Discuss how following proper coding standards and semantic rules impacts the readability, maintainability, and functionality of software projects. Provide examples from real-world programming languages, like Python or Java, to illustrate your points.

Coding Semantics are critical in programming because they create/enhance the user experience by providing accessibility, making coding easier to maintain and most importantly, making them easier to read. Accessibility in coding semantics provides users with “alternative text for images, proper heading structures, descriptive labels for form fields”(Secas, Elisabet; The importance of Semantic HTML) this makes the code more inclusive and accessible for all. It also adds to the searchability of your website. Search engines use semantics to locate websites based on keywords and labels. According to Secas, HTML uses Semantics to read and display information, paragraphs and headers for example. In HTML, <p> is a semantic tag that indicates a paragraph. (The importance of Semantic HTML) People can read this tag and infer even without knowing HTML what it stands for and how it is used. In that same vein, <h1> is header 1, which usually resides at the top of the document. This offers a clarity and structure that would not be present without the semantic structure. Also, the clarity and structure of semantics also makes it easier to maintain code as it goes through its life cycle. By assigning names and labeling functions other programmers can go over and retrace the steps of the program. From there proper improvements can be made and fixes can also be made if need be.

1. Version Control Systems: Benefits and Best Practices Research the role of version control systems (e.g., Git) in software development. Write about the benefits they offer for both individual developers and teams, and explain some best practices when using version control systems, especially in collaborative environments. Include an overview of how GitHub can enhance these processes.

Version control allows for collaboration, organization, backups, source code protection, history tracking , and efficiency to name a few of its benefits. According to Dave Braunschweig, organizations work on large projects that require multiple hands in the pot. Having a VCS allows these users to collaborate while being in different locations (Version Control). VCS’ like Github allows the creation and use of multiple branches that organize different versions of the same product. By having multiple branches this allows for a series of backups as well as the protection of the source code. As the name implies, Version control systems contain multiple versions of the same code. These versions are stored in the cloud of these applications and as a result any edits made can be tracked and examined. A real life example would be my company that created an EMR system. There are times when that system is pushed to production, but there is some bug that was unaccounted for. In these situations, the engineers rollback the version to the previous one and take it back to development for further investigation. Without a Version Control System, something like that would not be possible.

1. Data Structures in Python: Lists vs. Dictionaries. Write an in-depth comparison of lists and dictionaries in Python. Discuss their similarities, differences, and when it is most appropriate to use each. Provide specific examples that highlight the advantages of using lists for certain operations versus dictionaries for others.

A List is a data structure that allows the storage of a collection of items in an ordered and mutable sequence. They can be additions, removals and modifications after it has been created. A Dictionary is like a List in that it is a collection which is ordered, mutable. One difference between the two is that Dictionaries do not allow duplicates, but Lists do. ([www.w3schools.com](http://www.w3schools.com)) Dictionaries also use key value pairs. These Key Value pairs allow users to store specific information for different reasons. For example, Dictionaries can be used for grading, actual dictionaries, codes or translators, they can also be used for counting a certain characteristic (rounds, scores, etc.). Lists can be used to store multiple items together (prices, student names, different tasks), dynamically manipulate data like adding or removing elements, and iterating over data which helps with calculations, data processing or any operations that are repetitive. Dictionaries and lists can also be used to track user names and accounts and storing them in place where they can be pulled from indefinitely.

1. The Role of Functions in Writing Efficient Code: Research how functions contribute to more efficient, reusable, and maintainable code. Discuss the concept of 'modularity' and explain why breaking down a program into smaller, reusable functions is a good programming practice. Include examples from Python that demonstrate this concept.

Functions that are small and focused on a single task make code more modular, easier to read and easier to test. These same codes can be reused and placed in bigger functions to improve them as well if they fit within. Functions with well chosen names and variables can greatly improve readability, telling other programmers what this function is supposed to do while also reminding the creator as well. Modularity is a concept that involves breaking a system into separate modules that can operate independently. There are some programs that need to be broken down and separated into smaller chunks in order to operate as it may have more than one moving part or a sequence that depends upon another. Games are a good example. There are some games where a scenario are influenced by a choice made by the user. The program has to account for this choice and apply it to the proper function. By having small functions within the program you can account for these multiple scenarios and solve for them. It can also make things a lot simpler than trying to write a program all in one function.