CS 499 Module 4 Journal

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* **Briefly describe the artifact. What is it? When was it created?**

The artifact is a file reader that allows a ‘student’ to load a file containing a list of classes with the id, name, and prerequisites if there are any. The students can print the list, search for a particular class for more information, and exit the program. I created this in my CS300 a while back, I want to say beginning of this year or late last year.

* **Justify the inclusion of the artifact in your ePortfolio. Why did you select this item? What specific components of the artifact showcase your skills and abilities in software development? How was the artifact improved?**

I selected this artifact as it was one of my earliest demonstrations of utilizing algorithms and data structures. The original piece demonstrated algorithms to read in a txt file of courses and manipulate said data to print out a course and get more information on a course by searching for it in its vector. This was all done by a driving menu function.

The artifact was improved by expanding on the existing algorithms and vector data structure system incorporated within the file. I added more complex algorithms for searching for the course data by adding a check for uniqueness portion to the algorithm. I also added a check by professor algorithm for students who may have a favorite professor. These algorithms focused on optimizing the searches by ensuring uniqueness so there are no duplicate results and only searching until the result is found, then ending the search, reducing the runtime by O(N) of number (N) of results still available.

The main improvement was the addition of the planner portion. It utilized the same structure filled vector concept from the courses and allowed for the student to add their desired courses to the planner for future reference. It incorporated a more complex algorithm for adding the courses to the planner via a uniqueness check function via ID/Block for no duplicates, and Day/Time uniqueness check for no conflict of time within their schedule. The double uniqueness check did slow down the runtime, but it optimizes the results within the data structures, so it comes to a wash in resources used. This planner function had an export algorithm that wrote out the planner vector into a txt file for portability for the user. This function also had a print out of the current courses within the planner for ease of use for the user.

* **Did you meet the course outcomes you planned to meet with this enhancement in Module One? Do you have any updates to your outcome-coverage plans?**

I wanted to focus on 2, 3, and 4.

2 is to design, develop, and deliver professional-quality oral, written, and visual communications that are coherent, technically sound, and appropriately adapted to specific audiences and contexts.

For this outcome, I did have an interactive menu that provided prompts with the user and took in input from the user. Each function within the menu had clear and simple instructions while requiring user input for proper functionality of the program. The comments within the code provided who wrote the code, what version, and a detailed explanation of each file within the program to help other developers understand the layout and functionality of the code. There are many inline comments within the code in each file to explain each item and its relevance to the program and the demonstration of data structures and algorithms.

3 is to design and evaluate computing solutions that solve a given problem using algorithmic principles and computer science practices and standards appropriate to its solution while managing the trade-offs involved in design choices.

For this outcome, my computing solutions were predominantly focused on the manipulation of the data stored within the vector data structures by storing multiple values to a location within each position within the vector by the usage of structures storing all of a courses data within one set of memory. The program utilized many various algorithms to access the course and planner data vectors, manipulate the data by adding data to each data structure and providing access and allowing for search functions to access the data based on the user’s desired intentions. The reading and writing algorithms allowed data storage type changes from txt files to vector (reading) and vector to txt file (writing).

4 is to demonstrate an ability to use well-founded and innovative techniques, skills, and tools in computing practices for the purpose of implementing computer solutions that deliver value an accomplish industry-specific goals.

For this outcome, my organization of code and overall design of the code was to have one main work file, a header this work file inherited from, and the main function. I created modular code for each required function to ensure there is future ‘plug and play’ for the program should it need to be modified for additional features. I ensured all input is verified and if an error is present to throw an exception. These are my examples of industry-specific goals and standards.

For innovative techniques and skills, the usage of structures within the vectors allowed for reducing the amount of various data structures needed to store all the data, and reducing the number of algorithms required to navigate and manipulate the data within these vectors.

Outcome 5 was one I didn’t originally plan for but I covered within this artifact, which states to develop a security mindset that anticipates adversarial exploits in software architecture and designs to expose potential vulnerabilities, mitigate design flaws, and ensure privacy and enhanced security of data and resources.

The original artifact had essentially no code security involved as early in my career I was more focused on learning how to write code and simply attempting to get the program to work, not looking at reasons on why it could/would fail. I’m seeing now compared to my earlier coding career how it’s important to try to incorporate security features in any program to account for all potential threats to the program. I can’t just assume anymore that someone is going to use the program as they’re supposed to. The code utilizes security by a few methods. It removes all access to the code besides when the program prompts the user for input to navigate the program. This input is monitored to ensure the correct data type is utilized, and only acceptable input that allows the programs to function as intended is processed. Any type of code with the wrong data type or data entry is returned with an error and an attempt to redo the operation. The use of try/catch methods are the driver for the user data type checks. If the program sees anything that is not intended, it throws a general error that prompts the program to output an error message via the catch system.

* **Reflect on the process of enhancing and modifying the artifact. What did you learn as you were creating it and improving it? What challenges did you face?**

This time around I took the time to plan out the design of the product and I feel it paid off. This was much easier for me to focus on the code step by step instead of scrambling through the whole program. I focused on manual testing to help ensure the program is functioning as intended, either by using test cases or just attempting to break the program with invalid actions. My main struggles were finding how to manipulate the structures within the vectors. It wasn’t quite as simple as for ‘iterator c at I (c.i) compared to iterator p at i(p.i)’. I had to manipulate the structures to a manner where they output back to this simple form of iteration checking by making the iterations through the structures output as their respective titles of values (id is p.id, name is p.name, etc). I felt this was my biggest accomplishment with this artifact as it showed me how useful vectors are for data manipulation and just how many different ways it can be done depending on the needs of the application. I did need a refresher on outputting data into a txt file, but that was rather easy for this program. All in all, I felt way more comfortable with this program and I’m really happy with the results.