LAB 3 README

COLLABORATION:

I collaborated with Prithvi in our ECE class regarding the GIT aspect of our project. I had trouble understanding how to access and use all the commands to push all my files in the Git repository. He taught me all the repeated processes of how to push any file or folder in Git.

SUMMARY:

This lab focuses on the implementation of a basic 3x3 matrix math library in C. The important aspects of the lab are as follows:

1. **Matrix Math Library**: The goal is to create a library for performing various matrix operations on 3x3 matrices. This includes matrix addition, multiplication, transposition, submatrix extraction, determinant calculation, and inverse calculation.

2. **Header File**: The lab provides a well-documented header file, `MatrixMath.h`, which defines the function prototypes and describes the purpose of the library. It also includes constants like `FP_DELTA` for controlling the precision of floating-point operations.

3. **Modular Design**: The lab promotes a modular design, with each function responsible for a specific matrix operation. This separation of concerns makes the code more organized and maintainable.

4. **Matrix Display**: The library includes a `MatrixPrint` function that can display a 3x3 matrix with clean formatting. This is crucial for visualizing the matrices during testing.

5. **Testing**: The lab emphasizes thorough testing. The `mml_test.c` file contains the main program logic for running unit tests. It's essential to test the functions with a variety of scenarios, including trivial cases (adding 0, multiplying by 1) and more complex mathematical tests to ensure correctness.

6. **Mathematical Validity**: The implementation should respect the mathematical properties of matrices. For example, commutativity in matrix addition (A + B = B + A) should be tested and verified.

7. **Output in Main**: The main program logic in `mml_test.c` is responsible for running unit tests and displaying the results. Output should be clear, concise, and easy to read to facilitate error identification.

8. **Matrix Inverse Handling**: The library includes a function to calculate the inverse of a matrix, with a note that it cannot handle singular matrices. This limitation should be taken into consideration when working with the library.

Overall, the lab encourages a structured and systematic approach to implementing and testing matrix operations, with a focus on correctness, modular design, and mathematical validity.

APPROACH:

My initial approach to this lab assignment was suboptimal. I had not familiarized myself with the provided files or researched the requisite functions, and more importantly, I lacked a comprehensive understanding of the mathematical underpinnings of each function. Consequently, I approached the tasks in a laborious, non-optimized manner, neglecting the efficient use of loops.

Recognizing the need for a more structured and informed approach, I paused my coding efforts and conducted a thorough investigation into the functionality of each mathematical operation, often sketching out their procedures on paper. This intellectual groundwork significantly enhanced the logical coherence of my coding process. Subsequently, I successfully implemented all the required functions in the code, save for the notably complex "submatrix" function.

My attempts to tackle the "submatrix" function proved to be an arduous two-day endeavor. Despite exhaustive research, I was unable to locate relevant resources or guidance on how to proceed. My repeated efforts to achieve the expected output on the Matrix Programming and Linear Algebra Bench (mpalb) were in vain. Regrettably, I had to concede defeat and left the "submatrix" function unimplemented, leaving only the nine other functions within my code and test harness.

Additionally, I encountered difficulties in accessing "MatrixMath.h" within my file due to the requirement that the floating-point (FP) delta value could be altered in the professor's test cases. Consequently, I had to reorganize my project's file structure to ensure seamless accessibility to any required file through the "#include" directive.

As a final point of reflection, I must acknowledge my limitation to working solely with 3x3 matrices, as I was unable to extend my implementation to accommodate the "submatrix" function for matrices of other sizes, such as 2x2 or 4x4. If I were to revisit this lab, I would embark on more comprehensive pre-project research, thoroughly acquainting myself with each matrix function and its manual mathematical solutions. This approach would undoubtedly foster a more methodical and efficient execution of the assignment.

FEEDBACK:

I invested a substantial amount of time in this lab, approximately 15 hours spread over several days, from researching and understanding the mathematical concepts to coding and testing.

What I liked about this lab was the opportunity it provided to delve deep into matrix operations and enhance my understanding of their implementation. It served as a valuable exercise in problem-solving and coding. Additionally, the lab manual provided a clear structure for the assignment, and the examples covered in class were beneficial in understanding the core concepts.

However, there were several aspects I disliked. The "submatrix" function, which was considered the most challenging part of the lab, seemed somewhat unattainable even after extensive research.

The lab was worthwhile as it expanded my knowledge of matrix operations and problem-solving in coding. It provided a valuable hands-on experience.

To improve the lab, it would be helpful to provide more resources or guidance specifically on tackling the "submatrix" function, perhaps offering more examples or hints in the lab manual. Additionally, a more balanced distribution of points across all functions could better reflect the effort required for each task.

In terms of the points distribution, I found it somewhat disproportionate. It might be more equitable to distribute the points more evenly among the different functions, giving students a better chance to demonstrate their understanding of various aspects of the lab.

The lab manual covered the material adequately to get started, but additional teaching on the concepts involved, especially for the "submatrix" function, would have been beneficial. More in-depth discussions or examples during class related to this specific function would have helped students navigate the challenging aspects of the lab more effectively.