IN THE NAME OF ALLAH, THE GREATEST THE MOST MERCIFUL

INTERNATIONAL ISLAMIC UNIVERSITY CHITTAGONG

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Project Proposal

Matric / ID No.	: C211032
ID No. (in words)	: C-Two-One-One- Zero-Three-Two
Name	: Rashedul Arefin Ifty
Semester	: 7th
Section	: 7AM
Course Code	: CSE-4746
Course Title	: Numerical Methods Lab
Course Teacher Name	: Prof. Mohammed Shamsul Alam
Email ID	: r.a.ifty2001@gmail.com
Contact Number	: 01840003222

Submitted To:

Prof. Mohammed Shamsul Alam
Professor, Dept. of CSE
International Islamic University Chittagong

Project Title: Resource Allocation Using Systems of Linear Equations

Project Summary: The proposed project aims to develop a computational model for effective resource allocation in project management using systems of linear equations. This model will help project managers determine the precise quantities of manpower, equipment, and time required for various project tasks, ensuring optimal resource utilization under given constraints.

Introduction: Efficient resource allocation is critical in project management to achieve goals within constraints like limited manpower, specific equipment availability, and strict deadlines. This project proposes to address the resource allocation problem using mathematical methods involving systems of linear equations.

Problem Statement: The main challenge in project management is the accurate allocation of resources across different tasks. This involves determining the required quantities of manpower, equipment, and time for each task while adhering to constraints such as minimizing costs, optimizing resource utilization, and meeting deadlines.

Objectives:

1. Resource Quantification: Develop computational models to accurately calculate the required quantities of resources based on task requirements and availability.
2. Method Evaluation: Compare and analyze different mathematical methods for solving systems of linear equations, such as Matrix Inversion, Cramer’s Rule, and iterative methods like Jacobi and Gauss-Seidel.
3. Accuracy Assessment: Implement mechanisms to evaluate the accuracy and reliability of each method’s results.
4. User Interface Design: Create an intuitive user interface for inputting task requirements and constraints, selecting solution methods, and interpreting results.

Features:

- User input for matrix coefficients and constants.
- Implementation of Matrix Inversion Method, Cramer's Rule, Jacobi, and Gauss-Seidel methods for solving linear equations.
- Accuracy assessment of the computed results.
- Clear, menu-driven interface for method selection and result display.
- Efficient computation balancing accuracy and performance.
-

Implementation Overview:

1. Input Handling: A function to accept user input for the coefficients of the matrix and the constants vector.
2. Matrix Inversion Method: A function to compute solutions using matrix inversion, ensuring the matrix is invertible.
3. Cramer's Rule: A function to compute solutions using determinants.
4. Jacobi Method: A function to iteratively refine solutions until convergence.
5. Gauss-Seidel Method: A function to improve the Jacobi method using immediate updated values.
6. Accuracy Calculation: A function to evaluate the accuracy of computed results compared to expected outcomes.
7. User Interface: A main function to provide a menu-driven interface for method selection, input, and result display.
8. Error Handling: Include checks to handle non-invertible matrices, ensuring robustness and providing appropriate feedback.
9. Performance Considerations: Optimize iterative methods to balance computational efficiency and accuracy.
10. Modular Code Structure: Organize code into reusable functions for clarity and maintainability.

Example Dataset:

- Equation 1: $27x + 6y - z = 85$
- Equation 2: $6x + 15y + 2z = 72$
- Equation 3: $x + y + 54z = 110$

Expected Outputs:

- Computed solutions for resource quantities (x, y, z).
- Accuracy assessment of each method compared to actual solutions.

Conclusion:

This project will develop a robust computational tool for project managers to allocate resources efficiently using systems of linear equations. The proposed methods and their evaluation will ensure accurate and reliable resource management, optimizing project outcomes under given constraints.
