Integrated Circuit (IC) Management System for Lab Inventory

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Project Overview

The IC Management System is a simple, console-based software to manage ICs in a lab environment. It enables users to add, search, borrow, and return ICs while maintaining a log of basic operations. The project focuses on using core data structures and algorithms taught in the lab, such as linked lists, stacks, queues, and trees, to efficiently handle inventory tasks.

Motivation

Labs often struggle with organizing and tracking ICs. We have also struggled finding the right ICs for our DLD and CA projects This project will help keep an organized inventory while providing efficient search and retrieval operations, ensuring ICs are available for lab work.

Objectives

- Build a simple system to manage IC inventory.

- Allow basic operations like adding new ICs, searching, borrowing, and returning ICs.

- Utilize core DSA concepts to ensure efficient and scalable operations.

Key Features and Data Structures

1. Catalog Management (Linked Lists)

- Store details of ICs (name, type, stock count) in a singly linked list.

- Dynamically add or remove ICs as needed.

2. Borrow and Return System (Stacks and Queues)

- Use stacks to implement undo/redo for catalog changes.

- Maintain a queue of borrowers requesting ICs to handle operations fairly.

3. IC Search (Trees)

- Use a binary search tree (BST) to enable quick searches for ICs by name or ID.

4. Sorting and Searching

- Use linear search to find ICs in the linked list (simplified search for small catalogs).

- Implement a sorting algorithm (like selection sort) to organize ICs by name.

Implementation Plan

1. Phase 1: Core Structures

- Implement a linked list for IC catalog.

- Add basic operations like insertion, deletion, and traversal.

2. Phase 2: Borrow/Return System

- Add a stack for undo/redo operations.

- Use a queue to handle borrow requests.

3. Phase 3: Search and Sort

- Implement a basic BST for searching.

- Add sorting functionality to organize ICs.

4. Phase 4: Testing and Finalization

- Test for edge cases and optimize code for clarity.

Conclusion

This simple project uses fundamental DSA concepts to manage IC inventory effectively. It provides a practical application of linked lists, stacks, queues, and trees in a small-scale management system.