Green University of Bangladesh

Department of Computer Science and Engineering (CSE)
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Smart Library System

Course Title: Artificial Intelligence Lab
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Lab Project Status	
Marks:	**Signature:**
Comments:	**Date:**

Contents

Chapter 1

Introduction

1.1 Overview

The **Smart Library System** is an intelligent, interactive, and user-centric platform designed to modernize traditional library management. It offers book searching, graphical shelf visualization, automated capacity monitoring, and AI-based shortest path guidance for locating resources efficiently. By integrating a dynamic UI and algorithm-based decision support, the system enhances accessibility, usability, and overall learning experience.

1.2 Motivation

Libraries often face challenges such as inefficient searching, difficulty in tracking book locations, and manual monitoring of shelf capacity. Students and librarians lose valuable time while locating books physically. This project is motivated by the need to eliminate these inefficiencies through automation, visual guidance, and intelligent searching technology that makes access faster, smarter, and more engaging.

1.3 Problem Definition

Despite digital advancements, ordinary library systems lack guided navigation, real-time visualization, and automated book management capabilities. Users have no system-driven support to identify shelf load, find shortest walking routes, or interact with library resources meaningfully. Therefore, an enhanced smart system is needed to simplify search operations and improve navigation experience.

1.3.1 Problem Statement

To design and develop a system that helps users search, locate, and visualize books while integrating AI-based route guidance and smart inventory tracking for efficient navigation inside a library.

1.3.2 Complex Engineering Problem

The engineering complexity lies in merging multiple subsystems — book management, interface design, route optimization, data visualization, and user interaction — into a seamless, intelligent solution. The system deals with dynamic data, real-time display updates, decision automation, and algorithmic reasoning to achieve high usability.

Table 1.1: Attributes addressed by the Smart Library System

Project Attribute	**How It Is Addressed in Smart Library System**
P1: Depth of knowledge required	Involves UI design, data structures, algorithm reasoning (A*), CRUD operations, visualization, and system development.
P2: Conflicting requirements	Balances usability vs complexity, capacity limits vs book addition, and performance vs visual animation.
P3: Depth of analysis required	Requires analysis of routing algorithms, path cost prediction, usability evaluation, and functional integration.
P4: Familiarity of issues	Addresses problems like inefficient searching, poor navigation, shelf overloading, and lack of automation.
P5: Extent of applicable standards	Applies UI principles, data validation, search logic, inventory constraints, and software engineering models.
P6: Stakeholder involvement	Users (students), administrators (librarians), and developers interact through decision control and operational updates.
P7: Interdependence	Searching module depends on database, routing depends on map data, CRUD depends on constraints and UI state.

1.4 Design Goals/Objectives

The major objectives of the Smart Library System are:

- To provide an intelligent and user-friendly library interface.
- To enable fast and efficient book searching and filtering.
- To visualize shelf occupancy and resource distribution graphically.
- To integrate AI-based A* search for shortest route guidance.
- To support book management through CRUD operations.
- To automate decision support and improve accessibility.

1.5 Application

The system can be applied in:

- University and college libraries
- Public libraries and reading zones
- Academic institutions and resource centers
- Book retail stores with shelf navigation support

It helps students, librarians, and visitors by making book access easier, improving operational visibility, and enabling smart navigation inside the facility.

Chapter 2

Design/Development/Implementation of the Project

2.1 Introduction

2.2 Project Details

2.2.1 Subsection_name

2.3 Implementation

2.3.1 Subsection_name

The workflow

Tools and libraries

Implementation details (with screenshots and programming codes)

2.4 Algorithms

Chapter 3

Performance Evaluation

3.1 Simulation Environment/ Simulation Procedure

3.1.1 Subsection

3.1.2 Subsection

3.2 Results Analysis/Testing

3.2.1 Result_portion_1

3.2.2 Result_portion_2

3.2.3 Result_portion_3

3.3 Results Overall Discussion

3.3.1 Complex Engineering Problem Discussion

Chapter 4

Conclusion

4.1 Discussion

4.2 Limitations

4.3 Scope of Future Work

References