North South University

Project Report

Virtual Classroom System

Group 2

CSE215

Section: 08

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Abstract

This project introduces a Virtual Classroom, a desktop application designed to facilitate online education. The platform allows instructors to create courses, upload educational materials, and grade student assignments while enabling students to enroll in courses, access resources, and submit assignments. Developed using Java Swing, the application features a modern dark theme for enhanced usability. The Virtual Classroom is a self-contained and efficient solution for virtual education, addressing the needs of both instructors and students with an intuitive and aesthetically pleasing interface. Results demonstrate the application's ability to streamline course management and improve the virtual learning experience.

Objectives

1. To develop a user-friendly platform for managing virtual classrooms.
2. To enable instructors to:
    - Create and manage courses.
    - Upload educational materials.
    - View and grade student assignments.
3. To enable students to:
    - Enroll in courses.
    - Access course materials and assignments.
    - Submit assignments for grading.
4. To ensure all interactions are intuitive and visually appealing.

Key Features

Instructor Features

1. **Course Management:**
    - Create courses with a title and description.
    - Edit or delete existing courses.
    - View a list of courses created by the instructor.
2. **Material Upload:**
    - Upload PDF materials for each course.
    - View uploaded materials in the course contents.
3. **Assignment Management:**
    - View assignments submitted by students.
    - Grade assignments with a percentage score.

Student Features

1. **Course Enrollment:**
    - View a list of available courses.
    - Enroll in courses created by instructors.
2. **Material Access:**
    - Access course materials uploaded by instructors.
    - Download PDF files directly from the interface.
3. **Assignment Submission:**
    - Submit assignments for enrolled courses.
    - View the grading status and scores for each submitted assignment.

Dark Theme and Design

- The application incorporates a modern dark theme for improved aesthetics and readability, implemented using Java's Nimbus Look and Feel.
- Custom-styled buttons, labels, and panels enhance the user interface.

Technical Details

Languages and Tools

- **Programming Language:** Java
- **IDE:** Eclipse IDE
- **UI Framework:** Java Swing

Core Classes

1. **VirtualClassroom.java**:
    - Acts as the main class to manage UI panels and overall workflow.
    - Implements a CardLayout for seamless navigation between login, registration, student, and instructor panels.
2. **User.java**:
    - Defines common properties and behaviors for users (instructors and students).

3. **Instructor.java**:
    - Extends User to include functionality for creating courses and managing assignments.
4. **Student.java**:
    - Extends User to include functionality for enrolling in courses and submitting assignments.
5. **Course.java**:
    - Represents a course with details like title, description, instructor, uploaded materials, and submitted assignments.
6. **UserManager.java**:
    - Handles user authentication and registration for instructors and students.

Implementation Details

1. User Management

- **Registration:**
    - Users can register as either a student or an instructor.
    - A UserManager class ensures unique usernames for new registrations.
- **Login:**
    - Users can log in using their credentials, and the application verifies their role.

2. Course Management

- Instructors can create, edit, and delete courses.
- Courses are displayed with their titles and associated instructor names.

3. File Upload and Download

- Instructors can upload PDF materials to courses.
- Students can download these materials after enrolling in the respective courses.

4. Assignments

- Students can upload assignments for enrolled courses.
- Instructors can view and grade assignments, with grades visible to students.

5. Dark Theme Implementation

- The application uses Java's Nimbus Look and Feel for a modern aesthetic.
- Custom colors and fonts ensure a consistent dark theme across all components.

▪ Testing and Validation

Functional Testing

- **Login and Registration:**
  - Successfully tested for both roles (student and instructor).
- **Course Management:**
  - Verified the creation, editing, and deletion of courses by instructors.
- **Enrollment:**
  - Ensured students can view and enroll in courses.
- **File Upload and Download:**
  - Tested uploading and downloading of PDF materials for courses.
- **Assignment Management:**
  - Verified assignment submission by students and grading by instructors.

Usability Testing

- The dark theme improves readability and reduces eye strain.
- Styled components provide a polished and professional user experience.

▪ Challenges and Solutions

- **Challenge:** Maintaining functionality while applying dark theme styling.
  - **Solution:** Created helper methods to style components without altering their existing logic.
- **Challenge:** Implementing file upload and download functionality.
  - **Solution:** Used JFileChooser to allow file selection and java.nio.file.Files for file operations.
- **Challenge:** Keeping track of assignments and grades.
  - **Solution:** Integrated assignment tracking directly into the Course class and linked it with students.

▪ Screenshots

Fig.1 - Main Screen:

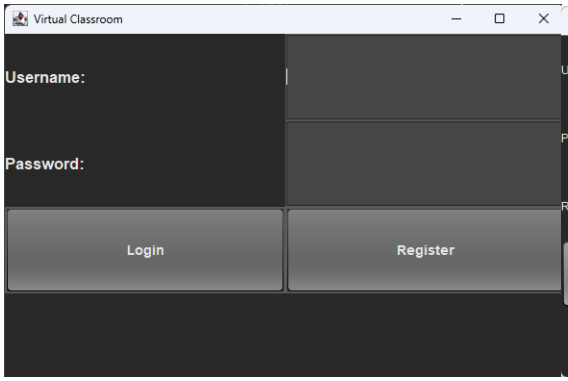


Fig.2 - Registration:

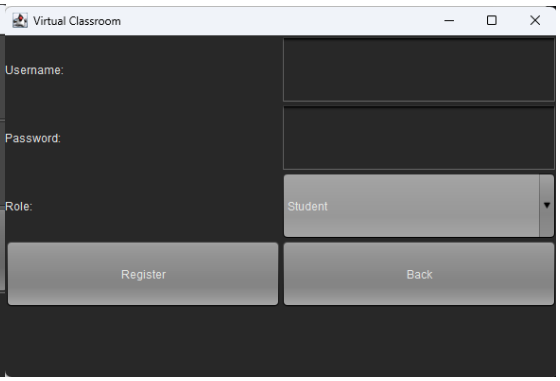


Fig.3 - Instructor Panel:

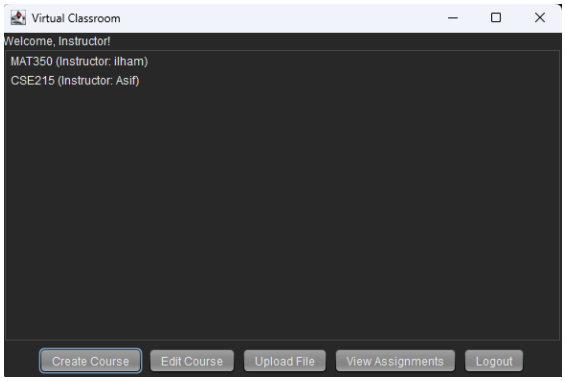
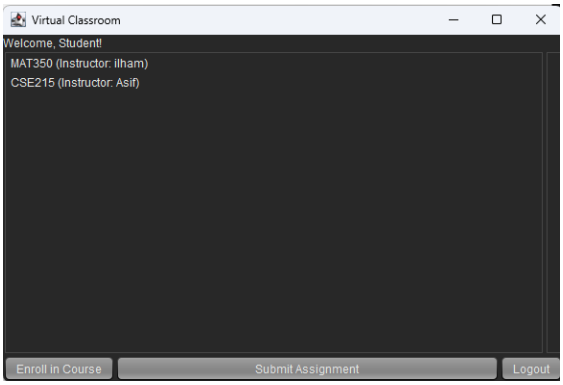


Fig.4 - Student Panel:



▪ Discussion

The Virtual Classroom provides a seamless experience for managing courses and assignments. The dark theme improves readability and user engagement. All core functionalities were tested and validated, demonstrating the robustness of the implementation.

▪ Future Enhancements

1. **User Notifications:**
    - Implement real-time notifications for assignment grading.
2. **Database Integration:**
    - Replace in-memory data storage with a database for scalability and persistence.
3. **Multi-User Support:**
    - Add support for multiple users accessing the platform simultaneously.
4. **Rich Content Types:**
    - Extend support for other file types (e.g., images, videos).

▪ Conclusion

The Virtual Classroom project achieves its objective of creating a standalone, user-friendly platform for online education. By addressing both instructor and student needs, the application enhances the virtual learning experience. The modern dark theme ensures an aesthetically pleasing interface, while the implemented features provide comprehensive course and assignment management.

▪ References

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2. "Java File Handling," GeeksforGeeks. [Online].
   Available: https://www.geeksforgeeks.org/file-handling-in-java/