

QuizApp: JavaFX-Based Interactive Quiz Platform

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Abstract

QuizApp is a desktop application developed using JavaFX and MySQL that provides an interactive platform for conducting programming quizzes. The application features user authentication, timed quizzes with automatic submission, real-time scoring, and a leaderboard system. Designed for educational purposes, it helps students test their Java programming knowledge with immediate feedback and performance analytics. The system follows MVC architecture and implements database persistence for tracking user progress over time.

Introduction

QuizApp addresses the limitations of traditional assessment methods by providing a modern, interactive quiz platform. In today's digital learning environment, immediate feedback and performance tracking are essential for effective learning. This application bridges the gap between traditional paper-based quizzes and modern digital assessment tools, offering a standalone solution that works without internet connectivity while providing rich analytics and user engagement features.

Objectives

- Develop user-friendly desktop quiz application using JavaFX
- Implement secure user authentication and registration system
- Create robust MySQL database for storing users, questions, and scores
- Implement timer-based quiz system (15 seconds per question)
- Provide performance analytics through interactive leaderboards
- Ensure cross-platform compatibility (Windows, macOS, Linux)
- Implement error handling and data persistence mechanisms
- Create intuitive user interface with smooth navigation

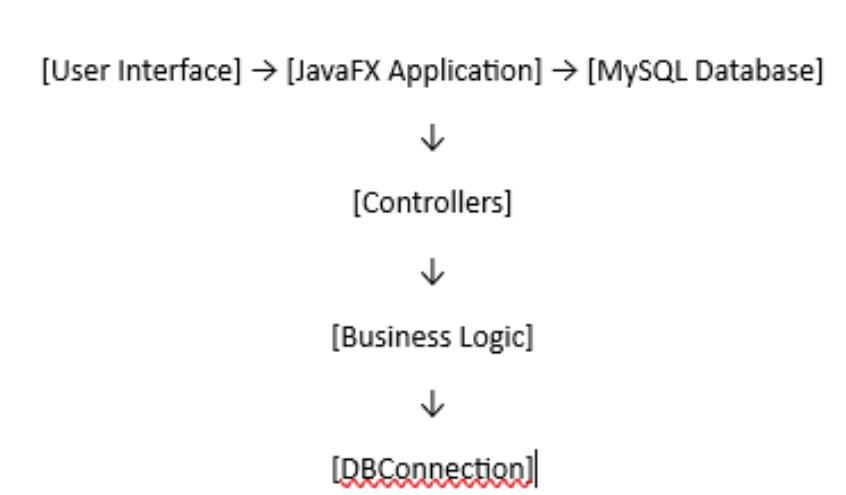
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System Architecture

Three-Tier Architecture:

1. **Presentation Layer:** JavaFX FXML views and controllers
2. **Business Logic Layer:** Quiz logic, timer management, scoring algorithms
3. **Data Layer:** MySQL database with JDBC connectivity



Key Features

- **User Authentication:** Secure registration/login
- **Timed Quizzes:** 15 seconds per question
- **Auto-Submission:** Automatic timeout handling
- **Instant Scoring:** Real-time result calculation
- **Leaderboard:** Competitive ranking system
- **Database Storage:** Persistent score tracking
- **10 Java Questions:** Programming fundamentals
- **5 Interface Screens:** Complete user journey
- **Error Handling:** Graceful failure management
- **Cross-Platform:** Windows, macOS, Linux support
- **Responsive UI:** Adaptive layout design
- **Data Validation:** Input sanitization

Technology Stack

Component	Technology
Programming Language	Java (JDK 21)
GUI Framework	JavaFX 21.0.8
Database System	MySQL 8.0
Database Connectivity	JDBC + MySQL Connector/J
Build Tool	Apache Maven 3.9+
Development IDE	IntelliJ IDEA 2024+
Software Architecture	MVC Pattern
Version Control	Git & GitHub
Dependency Management	Maven Central
UI Design	JavaFX Scene Builder

Implementation Highlights

Database Design:

- Users table with auto-increment ID
- Scores table with foreign key relations
- Referential integrity constraints
- Timestamp tracking for all records

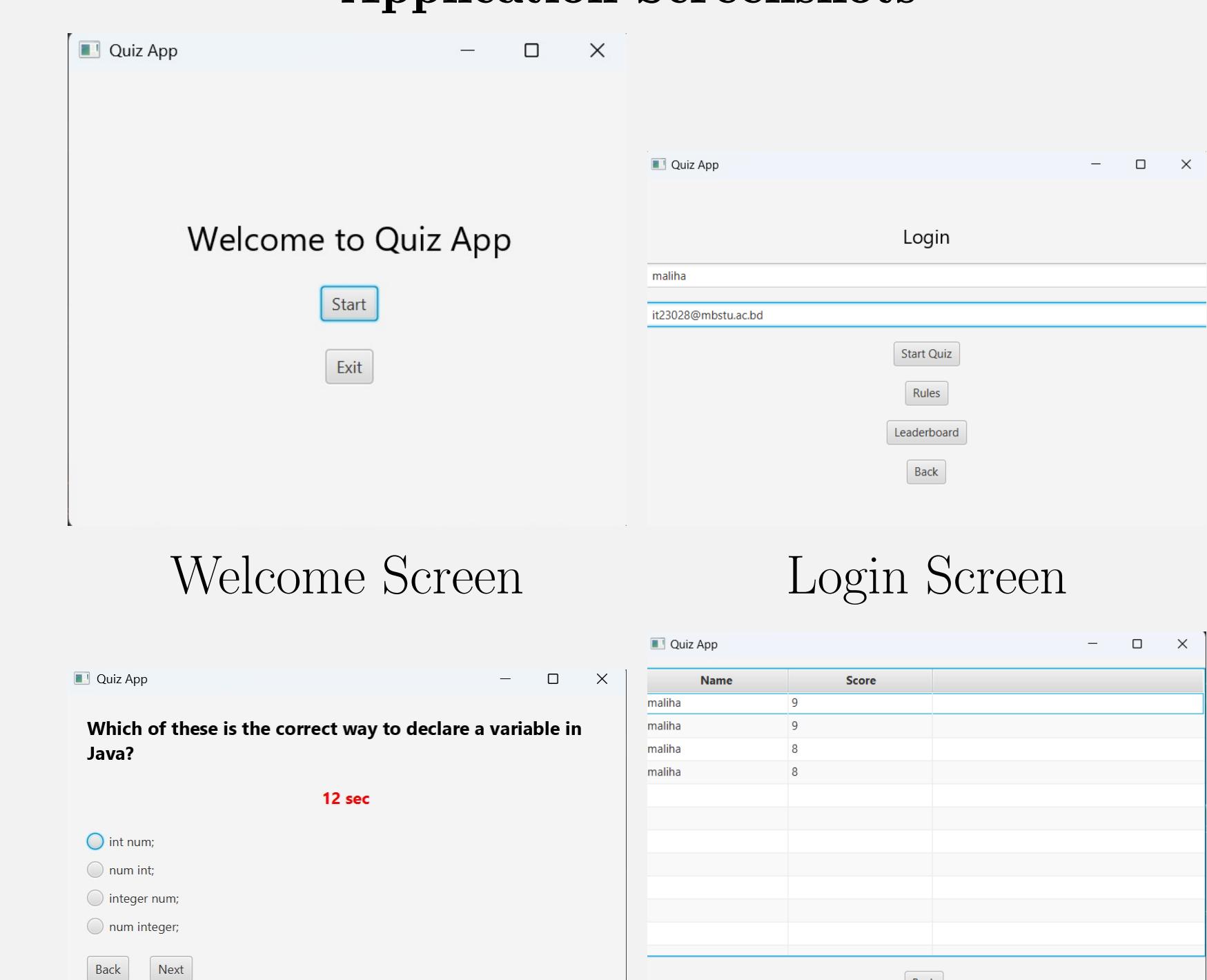
Core Implementation:

- Singleton DB connection pattern
- JavaFX Timeline for precise timing
- FXML for declarative UI design
- Prepared statements for SQL security

Key Algorithms:

- Score calculation algorithm
- Timer synchronization mechanism
- Leaderboard ranking algorithm
- User session management

Application Screenshots



Welcome Screen

Login Screen

Quiz Screen

Leaderboard

Conclusion

The QuizApp project successfully demonstrates the development of a comprehensive desktop quiz application using modern Java technologies. Key achievements include:

- Complete implementation of MVC architecture with JavaFX
- Robust database design with MySQL and JDBC integration
- Interactive user interface with 6 distinct screens
- Real-time timer functionality with automatic submission
- Comprehensive scoring and leaderboard system
- Cross-platform compatibility across major operating systems
- Proper error handling and data validation mechanisms

The application serves as an effective educational tool for Java programming assessment, providing immediate feedback and performance tracking capabilities that enhance the learning experience.

Future Work

- Multiple quiz categories
- Admin management panel
- Mobile application version
- Network multiplayer mode
- Difficulty levels (Easy/Medium/Hard)

References

GitHub Repositories

<https://github.com/muslimamaliha/ID-IT23028>
https://github.com/Jannatulmona/project_quiz_game