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DEPARTMENT OF COMPUTER SCIENCE

OPTION OF SOFTWARE ENGINEERING

Group 5

STUDENT MANAGEMENT SYSTEM

Year III SWE Group A

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Scientia et Lux

Student Management System Documentation

System Overview

The Student Management System is a Windows Forms application built with **C#** that provides a modern, Material Design-inspired interface for managing student records. The system implements a three-panel layout architecture with integrated SQLite database management for persistent data storage.

Technical Architecture

User Interface Components

1. Header Panel

   - Contains the application title

   - Uses a distinctive blue color scheme (RGB: 33, 150, 243)

   - Spans the full width of the application window

2. Side Panel

   - Width: 250 pixels

   - Contains input controls and action buttons

   - Custom Material Design-inspired components:

     - MaterialTextBox: Enhanced TextBox with placeholder support and bottom border

     - MaterialButton: Flat-style button with hover effects and color feedback

3. Main Panel

   - Houses the DataGridView for student records display

   - Implements alternating row colors for better readability

   - Custom styling for headers and cell contents

Database Architecture

- Database Engine: SQLite

- Main Table: Students

  - StudentID (INTEGER, PRIMARY KEY, AUTOINCREMENT)

  - Name (TEXT, NOT NULL)

  - Age (INTEGER)

  - Grade (TEXT)

Custom Controls

MaterialButton

Inherits from standard Button control

Features:

  - Flat appearance with zero border

  - Custom hover effects

  - Color feedback for user interaction

  - Bold Segoe UI font

MaterialTextBox

Inherits from standard TextBox control

Features:

  - Custom bottom border

  - Placeholder text support

  - Modern typography with Segoe UI font

  - Dynamic color states for focus and placeholder

Core Functionality

Data Management

1. Create Operation

   - Input validation for required fields

   - Age validation for reasonable values

   - Parameterized SQL queries for security

   - Immediate feedback on success/failure

2. Read Operation

   - Efficient data loading with DataGridView

   - Custom column formatting

   - Hidden technical fields (StudentID)

   - Alternating row colors for readability

3. Update Operation

   - Modal dialog for editing

   - Pre-populated fields

   - Comprehensive validation

   - Optimistic concurrency model

4. Delete Operation

   - Confirmation dialog with student details

   - Soft deletion feedback

   - Error handling for database operations

Real-World Applications

Educational Institutions

1. Primary Schools

    - Track student enrollment

    - Manage grade assignments

    - Monitor age distribution

    - Generate class lists

2. Secondary Schools

    - Track academic progress

    - Manage student transfers

    - Monitor grade distribution

    - Generate academic reports

3. Tutorial Centers

    - Manage student enrollment

    - Track attendance

    - Monitor performance

    - Schedule management

Administrative Benefits

1. Efficiency Improvements

    - Reduced paperwork

    - Quick access to student records

    - Streamlined data entry

    - Automated record keeping

2. Data Analysis

   - Age distribution analysis

   - Grade performance tracking

   - Enrollment trend monitoring

   - Capacity planning

3. Resource Management

   - Classroom allocation

   - Teacher assignment

   - Academic planning

   - Resource distribution

Security Features

1. Data Protection

   - SQLite database encryption support

   - Parameterized queries prevent SQL injection

   - Input validation prevents malicious data

   - Controlled data access

2. Error Handling

   - Comprehensive try-catch blocks

   - User-friendly error messages

   - Database transaction management

   - Data integrity preservation

System Requirements

Hardware Requirements

- Minimum 2GB RAM

- 100MB free disk space

- 1024x768 screen resolution

- Standard keyboard and mouse

Software Requirements

- Windows 7 or later

- .NET Framework 4.5 or later

- SQLite support

- Administrative privileges for installation