Cairo University Faculty of Engineering

Dept. of Electronics and Electrical Communications

Second Year

Advanced Tic Tac Toe Game

Software Requirements Specification (SRS)

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1. Introduction

1.1 Purpose

This document specifies requirements for a Tic Tac Toe implementation featuring an unbeatable AI opponent, user authentication, and game history tracking using SQLite.

1.2 Scope

The system includes:

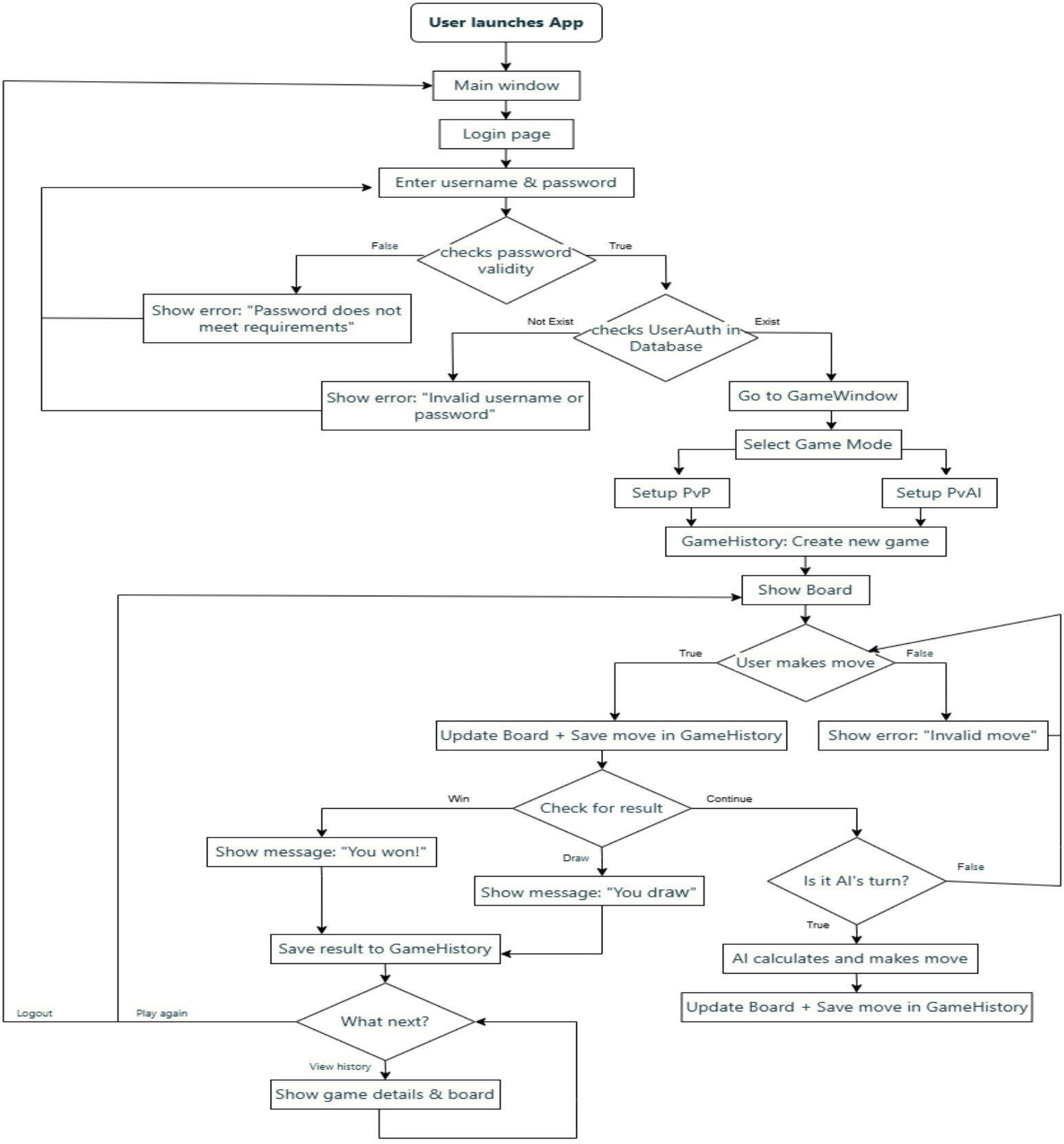
- Unbeatable AI using Minimax with Alpha-Beta Pruning
- User authentication system
- Persistent game history storage
- Qt-based GUI
- Move validation and game state management

2. Overall Description

2.1 Key Technologies

- C++17
- Qt 6.x (GUI Framework)
- SQLite3 (Database)
- Minimax Algorithm with Alpha-Beta Pruning

2.1 System Architecture



3. Functional Requirements

3.1 Core Gameplay

Requirement	Technical Implementation
3x3 game board	`Board class` with 2D array
Move validation	`isValidMove()` method
Win detection	`checkWinner()` method
Game reset	`resetBoard()` method

3.2 AI System

Requirement	Technical Implementation
Unbeatable AI	`minimax()` with Alpha-Beta pruning
Optimal move selection	`findBestMove()` method

3.3 User Authentication

Requirement	Technical Implementation
Secure login	SHA-256 hashed passwords
Session management	`UserAuth class`
Invalid login feedback	clear error messages

3.4 Game History

Requirement	Technical Implementation
Game recording	`GameHistory class` with SQLite
Game replay feature	Replay button in GameHistoryGUI to step through previous games

4. Non-Functional Requirements

4.1 Performance

We have written this report in a separate report.

4.2 Security

- Password hashing using SHA-256
- SQL injection prevention via parameterized queries
- Error messages for incorrect credentials or sign-up validation

4.3 Reliability

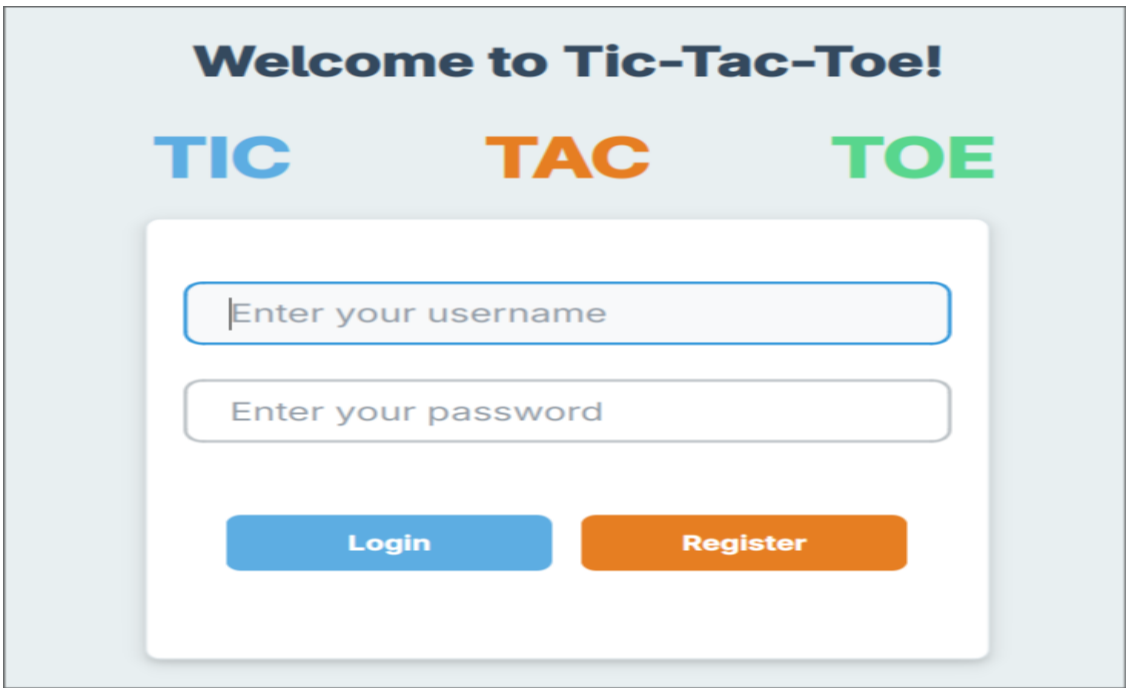
- 99.9% successful transaction rate
- Automatic database connection recovery

5. Interface Requirements

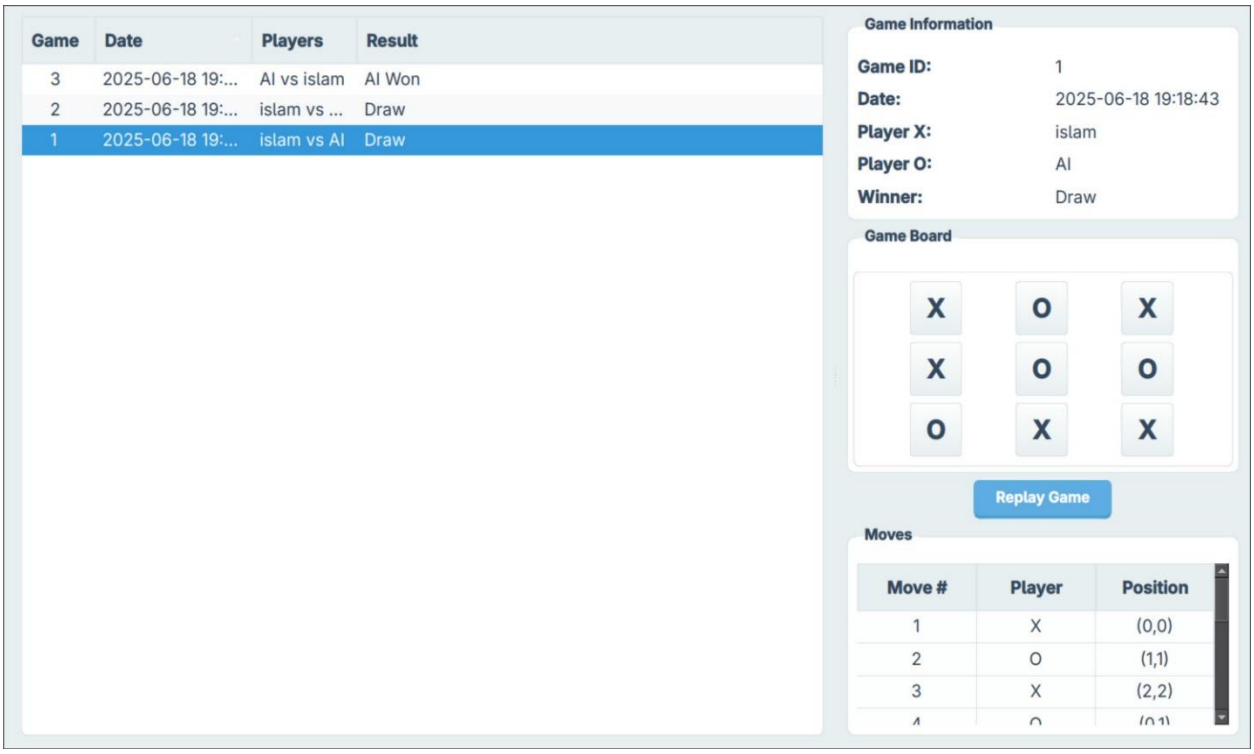
5.1 User Interfaces

The GUI includes a modern design with custom colors, fonts, rounded buttons and animated effects for moves and winning cells. The game window features Logout and View History buttons with distinctive styles. Game setup screens allow for mode and symbol selection. The GameHistoryGUI window displays a list of previous games, details, and a replay feature for each game.

Screen	Components
Login	`QLineEdit, QPushButton`
Game Board	`QLabel grid, StatusBar`
History	`QTableView, QPushButton`



Game History



Game Board