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Kakuro Game White Paper

January 2024

Summary

Introduction

Kakuro is a game of logic, combining the challenge of math puzzles with the strategy of Sudoku. This project aims to bring the joy of Kakuro to users through a thoughtfully designed application that prioritizes accessibility, functionality, and user engagement through competitive and leader board driven gameplay.

Problem Statement

While Kakuro is widely enjoyed, digital implementations often lack user-friendly interfaces or dynamic puzzle generation, making them less engaging for users. Furthermore they very rarely allow users to save their progress, gameplay or data and even less often offer competitive feature that keep users engaged such as “days played tracker” or leaderboards.

Proposed Solution

This Kakuro game will offer an intuitive user experience, robust puzzle generation, account creation feature to store progress, a leader board, player history, a daily game (inspired by wordle) and a “days played count” (inspired by githubs green squares).

Overview

Architecture and Tech

This project will be a complete full stack Web project. The Database will consist of multiple ***MongoDB*** clusters to store users information and game play. The users themselves will be playing the games on an ***ASP DOTNET CORE Web MVC*** hosted on ***AZURE*** through continuous integration / continuous deployment. For security reasons and in order to implement backed processing, the web app wont communicate directly with the DB. We will rather implement an ***ASP DOTNET CORE API*** also hosted on Azure.

System Requirements

We decided to make a web application in order to mitigate any issues as to system requirements. However the user must be using a ***DESKTOP*** since we wont go through the extra hardships to make the front end app reactive it will look wonky on mobile.

Key Benefits and Features

I Authorization and authentication (Login, logout, create account, reset password, etc).

II User history, statistiques and previous gameplay.

III Leaderboards and ranks based on performance (time per game + amount of games played).

IV Daily Kakuro (inspired by wordle where every player gets the same game once a day to see how fast they can solve it).

V Counter of days played and how much played each day (inspired by Github's green squares).

Roadmap

Phase I

Create the DB, API template and web app template. Build out and document the authorization and authentication features as well as the 3x3 kakuro game feature.

Phase II

Create and document the user history and statistics features as well as the leaderboards and ranks features.

Phase III

Create and document the daily Kakuro challenge feature as well as the counter of days played feature. If there is time and energy left, create more possible kakuro setups (9x9, etc).

User Authentication Flow

1. **User Registration:**
    - User provides an email, username, and password.
    - System validates inputs and stores credentials securely.
    - Confirmation email is sent for verification.
2. **Login Process:**
    - User enters credentials.
    - System verifies credentials and grants access.
    - Session management ensures authentication is maintained.
3. **Password Reset:**
    - User requests password reset via email.
    - A unique reset link is generated and sent.
    - User sets a new password and logs in.

Daily Challenge Flow

1. **Accessing the Daily Game:**
    - Available once per day for all players.
    - Same puzzle for all participants.
2. **Gameplay:**
    - Standard Kakuro rules apply.
    - Players aim to complete the puzzle as quickly as possible.
3. **Leaderboard Update:**
    - Fastest completion times are ranked.
    - User's personal best time is stored.

Navigation Flow

- **Navigation Flow:**
  - From the home screen, users can select from the following options:

New Game: Leads to a difficulty selection screen (Easy, Medium, Hard) or initiates a random puzzle generator for a surprise challenge.
Continue: choose the unfinished puzzle that user saved before.

Puzzle Library: Opens a list of available puzzles, sortable by difficulty and freshness (e.g., most recent or most popular).

View Stats: Displays the user's game performance metrics, including completed puzzles, average time, and success rate.

Settings: Allows customization of game preferences, including themes, sound settings, and timer options.

- **Starting a New Game:**
  - Users choose a difficulty level or select a random puzzle.
  - The system generates the puzzle grid based on the selected criteria.
- **Puzzle Library Interaction:**
  - Users can browse puzzles with sorting and filtering options.
  - Clicking on a puzzle opens the game board for that specific puzzle.

Puzzle interaction

Game Board: Display a grid with rows and columns labeled with the sum values. Players can tap on each cell to input a digit (1-9).
Error Handling: Highlight cells where players input invalid numbers (either duplicates or incorrect sums).
Hint Display: When users hover over or tap a row/column, show the sum for that segment and any additional hints.
Timer: Optional countdown timer or stopwatch to track game time.
Undo/Redo: Allow users to step back or move forward in their inputs.
Reset: Clear the whole board.
Correct Answer: Highlights when the number when the total of selected numbers of column/row are correct.