CSC470: Software Engineering Final Report
TESS: The Extraordinary Sudoku Solver

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v1.1

Table of Contents

1   Summary

High level summar with 1 page. the project goals, motivation or problem issues `!!!`
(requirements). Design considerations and choices to solve the problems to
achieve the goals. Implementation, validation and testing plans.

2   Introduction

Overall introduction

2.1   Purpose

2.2   Scope

2.3   Definitions, acronyms, and abbreviations

Term	Definition
DESC	Description
Grid	This is where all the values are stored for the player to see.
ID	Identification
PW	Priority Weights
User	Whoever will be using the app

3   Goals

This is the goals section.

4   Specific Requirements

This is the specific requirements section.

Be sure to include numbering scheme including Identifier (RQ1, RQ2, and
RQn) and PW (the priority weights, may be the highest priority = 5 and the
lowest priority = 1) to allow traceability.

Provide a high-level use case diagram for the high-level system models and
a traceability matrix for the requirement validation.

4.1   Functional Requirements

ID:R1   `How to add todo`

TITLE: Play Game Option
DESC: The user first opens up the app, they should be able to choose the option
to play a Sudoku puzzle. They user should be able to stay as long as they want
to on this screen.
PW: 3

ID:R2

TITLE: Select Difficulty

DESC: The user should be able to select a difficulty setting that better suites needs at any time. There should be 5 difficulty options for the user to choose from. 1 being the easiest all the way down to 5 being the hardest.

PW: 2

ID:R3

TITLE: Back Option

DESC: The user should be able to return to the main screen from the select difficulty screen if they don't select a difficulty. The user can remain on the select difficulty as long as the want to.

PW: 1

ID:R4

TITLE: Continue Game

DESC: The user should be able to continue a game that has been previously started whether or not the app has been closed. All of the user's input should be saved so they could be brought up again should the user want to continue a game.

PW: 4

ID:R5

TITLE: Get Puzzle

DESC: When the user selects a difficulty, a puzzle with the selected difficulty should be retrieved from the database for the user to be able to play it and enjoy the game.

PW: 2

ID:R6

TITLE: Solver Option

DESC: On started, the user should be able to select the Solver option in the app to go straight to the solver part of the app.

PW: 5

ID:R7

TITLE: Input Sudoku Puzzle To Solve

DESC: The user needs to be able to input any sort of Sudoku puzzle that the user has, with or without any extra numbers the user wishes to input.

PW: 5

ID:R8

TITLE: Check Current Board

DESC: The user should be able to check the status of the current puzzle they are working on. The user should be able to view the inputs that are conflicting

with each other. They should be marked in some way for the user to be able to see them clearly.
PW: 4

ID:R9
TITLE: Delete an Input Value
DESC: The user should be able to delete an input value that they put in previously or a value that the system put in automatically.
PW: 5

ID:R10
TITLE: Clear Board
DESC: The user should be able to clear the entire board easily and effortlessly.
PW: 3

ID:R11
TITLE: Solve Current Board
DESC: The user should be able to have the option to solve the current board that they are working on. It should use the input the system put in as well as the inputs the user decided to add.
PW: 5

ID:R12
TITLE: Play Sudoku Game
DESC: The user should be able to play a Sudoku game by selecting certain boxes and input a value into them.
PW: 4

ID:R13
TITLE: Hint Option
DESC: The user should have the option to get a hint on the current Sudoku game they are playing. The hint should display any correct value on the given board.
PW: 1

ID:R14
TITLE: Download Mobile Application
DESC: The user should be able to download the mobile application either from the Play Store or via Email to their Android phone. The download should be free.
PW: 5

4.2   Non-Functional Requirements

ID:RQ1
TITLE: System Availability
DESC: The system needs to be available to the user 99.9% of the time, whether or not the system is being used. The system can only be down for 0.1% of the time for updates or maintenance.

ID:RQ2
TITLE: Solve Time
DESC: The app should be able to solve a given Sudoku puzzle, whether there is or isn't a solution in under 5 seconds.

ID:RQ3
TITLE: Search Algorithm
DESC: The Suduko solver must utilize some search algorithm such as depth first search or breadth first search or any other searching algorithm.

ID:RQ4
TITLE: Pruning Technique
DESC: There must be some sort of pruning technique with solving the problem because 9^{81} is not feasible.

ID:RQ5
TITLE: Database Storage
DESC: The Database needs be stored locally on the device and new puzzles should be added to the device through updates or pulled from an external database.

ID:RQ6
TITLE: Easy to Use
DESC: The app should be very simple to use to any player with some general idea of how Sudoku puzzles work.

ID:RQ7
TITLE: Private Information
DESC: The app should not keep any personal information about the user. There app should not ask the user for any passwords.

4.3   System Model

4.3.1   Actors

- Player: This is the primary actor who will be using the app.

- Database: This is the datastore that on the device that contains all the Sudoku puzzles for the user to play.

4.3.2   Use Cases

ID:UC1
TITLE: Select Play Game
ACTORS: Player
DESC: Player opens up the app and selects to play a Sudoku puzzle.

ID:UC2
TITLE: Select Solver
ACTORS: Player
DESC: Player opens up the app and selects the Solver option to solve a Sudoku puzzle they might have.

ID:UC3
TITLE: Selects a difficulty
ACTORS: Player and Database
DESC: Player selects a difficulty from the options available and a Sudoku board is filled with a puzzle similar to the difficulty the Player selected.

ID:UC4
TITLE: Quitting Time
ACTORS: Player and Database
DESC: When Player decides to quit the puzzle they are currently working on, the puzzle is saved to the database so Player can continue playing it.

ID:UC5
TITLE: Selecting Continue
ACTORS: Player and Database
DESC: When Player decides to play a game again and selects the continue option to bring up the previously saved game they were playing.

ID:UC6
TITLE: Hint Option
ACTORS: Player
DESC: The Player is unsure of any other moves, so Player decides to select the hint option in order to recieve a hint about the current Sudoku puzzle they are working on.

ID:UC7
TITLE: Solve Option
ACTORS: Player
DESC: The Player is tired of playing and wants to see the solution to the Sudoku puzzle, so they decided to tap the solve button to get all the answers.

5 System Design

This is the system design section.

5.1 Desgin Overview

Provide an overview of the design, including diagrams, key design subsections, and how they relate or connect to one another (e.g., Interaction, structural models).

5.2 Realistic Constraints and Professional Standards

Identify and discuss realistic constraints on the problem, such that constraints may include economic, environmental, social, ethical, health and safety, manufacturability, policy issues, etc.

5.2.1 Constraints

ID:C1
TITLE: Memory Space
DESC: The app should have a small footprint. The entire app should take up less than 5MBs of memory, this is including with future updates as well.

ID:C2
TITLE: Internet Connection for Updates
DESC: The app must have an internet connection established to be able to retrieve updated information from a master database.

ID:C3
TITLE: Programming Language
DESC: The app must be written in mainly Java, there may be other languages within the program, but the main part of it should be in Java.

ID:C4
TITLE: Android Device Only
DESC: The system must work on Android Devices, specifically the Galaxy Note 5 first, the following versions will include other phone models.
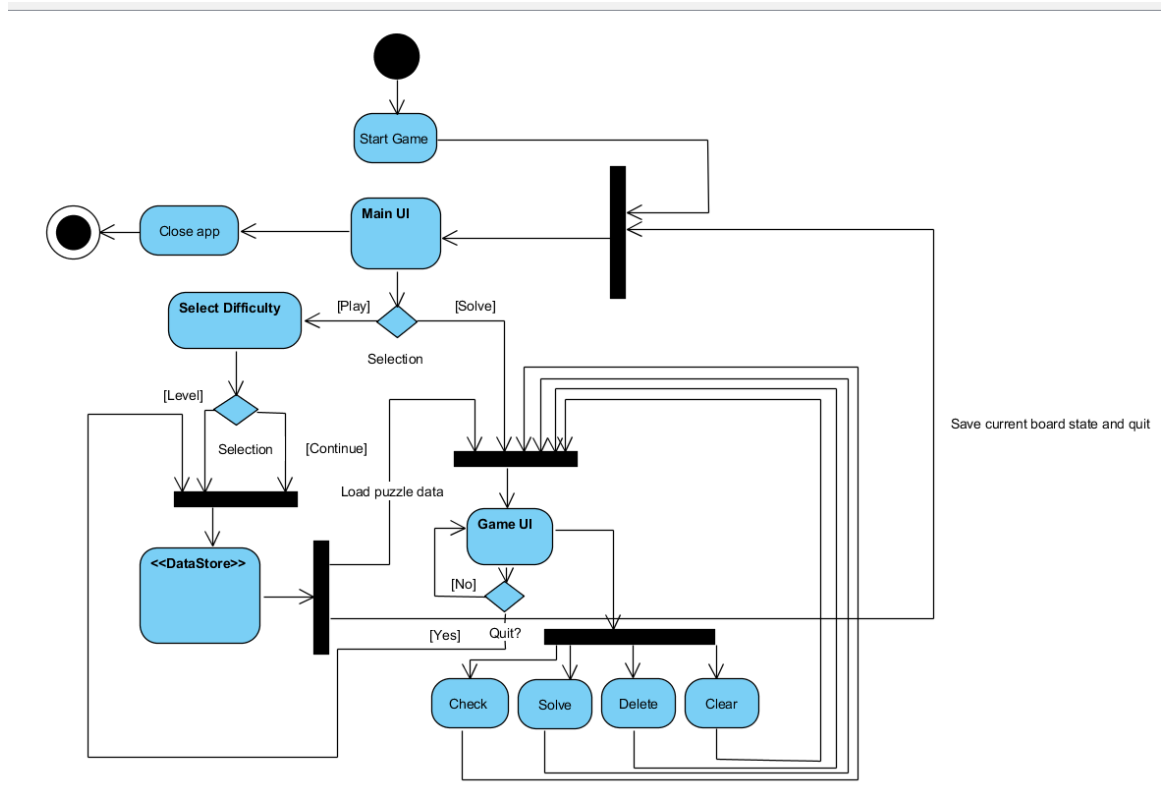
Figure 1: Activity diagram of a system.

ID:C5
TITLE: Time to Solve
DESC: The app should take less than 5 seconds to output the solved Sudoku puzzle or report that it can't be solved.

ID:C6
TITLE: Database Usage
DESC: The app must utilize some sort of database to hold the stored puzzles.

5.3 Alternative Designs and Design Choices

Describe alternative designs that were considered during execution of the project. Discuss how design choices were guided by constraints and other factors. E.g., architectural design models – Layered or Client-server and details shown using activity diagram as shown in Figure 1 (Context model), sequence diagram
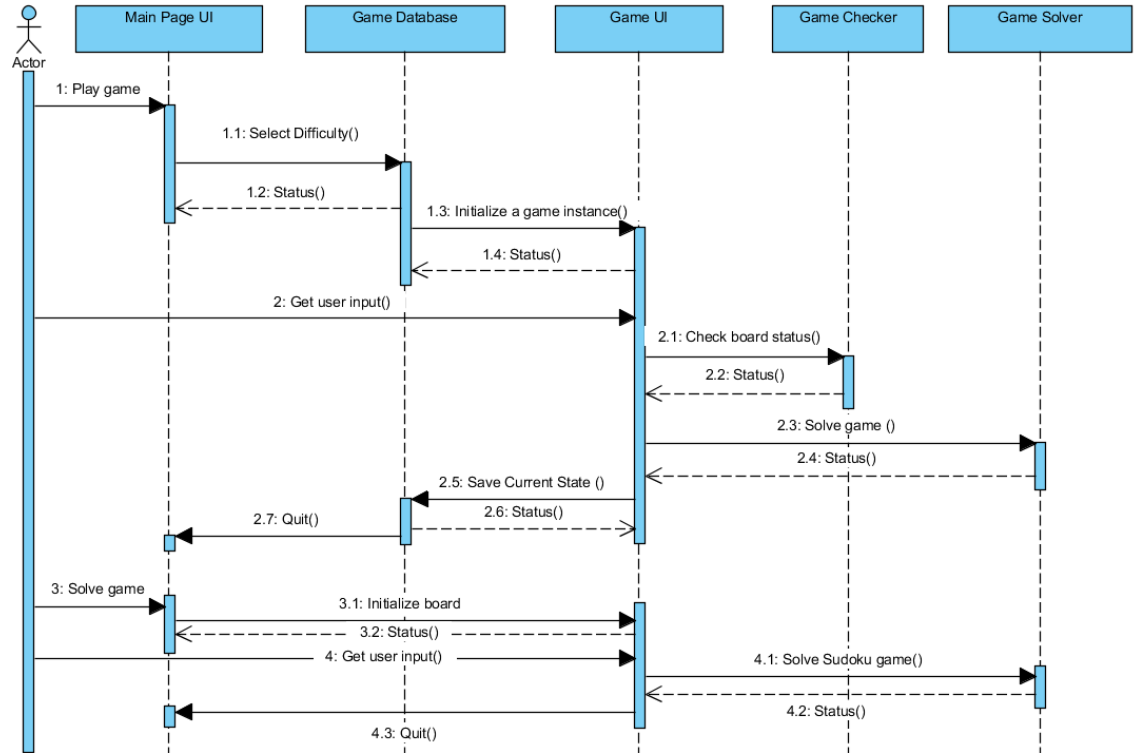
Figure 2: Sequence diagram of a system.

(Interaction model), class diagram (Structural model).

6   System Implementation

This is the system inplementation section.

Describe the technical details for each of the subsystems or a the system-level and provide sequence diagrams or station/activity diagrams for your system implemenation.

7   System Testing

This is the system testing section.

7.1 Test Plan

Provide your test plan with unit testing (Black-box testing and White-box testing), integration testing (Top-down or bottom-up approach) and system testing.

7.2 Test Results

Show your test restults and evaluate them.

8 Conclusions

This is the conclusions section.

Overall summary of design methodologies, key creative approaches and potential contribution/impact. [1]

References

[1] J. Mammo, "Hahahahaha," *Computer Networks*, vol. 71, pp. 1–30, 2017.