



Mobile Application Development Laboratory

MINDGRID: NUMBER TILE PUZZLE

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Abstract

- **MindGrid: Number Tile Puzzle** is an Android-based mobile game designed to enhance logical thinking and problem-solving skills through interactive gameplay. The game presents a classic 3x3 sliding puzzle where users must arrange numbered tiles in sequential order. Upon clicking the "Shuffle" button, tiles are randomly mixed and a timer starts, tracking how quickly the player completes the puzzle. Each move is counted, motivating users to optimize their strategies. It not only provides entertainment but also promotes cognitive development by encouraging users to minimize moves and solve puzzles faster, thereby offering a perfect blend of fun, focus, and mental exercise.

Need for the Proposed System

- Existing puzzle games often lack key features like performance tracking, clean UI, and optimization for all devices. Many do not include timers or move counters, reducing user engagement and cognitive benefits. A better-designed puzzle app is needed to combine fun with measurable mental improvement.
- While numerous sliding puzzle games exist in the mobile market, many lack features that support continuous cognitive improvement or provide measurable performance feedback. Existing games often have cluttered interfaces, lack optimization, or do not include essential features like move counters and timers. These omissions reduce the educational value and engagement of such apps.

Advantages of the Proposed System

- Includes **timer** and **move counter** to track performance.
- **Random shuffle** ensures a new challenge each time.
- Clean and **user-friendly interface** for all age groups.
- Promotes **logical thinking** and **strategic planning**.
- Encourages **continuous improvement** through measurable feedback.

Literature Survey

Paper 1:

Title: *The Role of Mobile Gaming in Cognitive Development*

Authors: Smith, A. & Smith, J. (2022)

- **Advantages:**
 - Highlights how puzzle games enhance memory and decision-making.
 - Emphasizes educational value in gaming.
- **Disadvantages:**
 - Lacks focus on user interface design and real-time feedback.

Paper 2:

Title: *Gamification in Mobile Applications for Cognitive Enhancement*

Authors: Sharma, R. & Gupta, V. (2023)

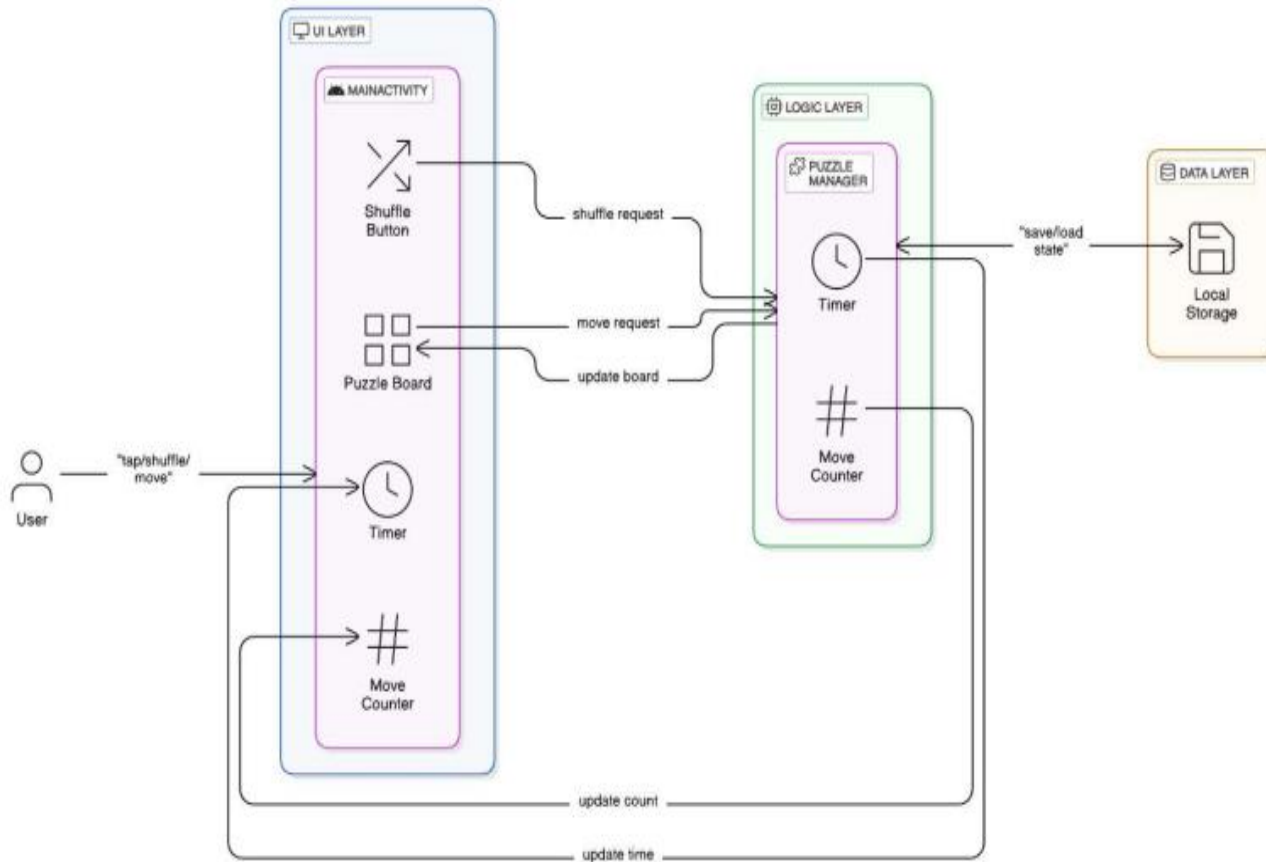
- **Advantages:**
 - Shows how gamification boosts motivation and learning.
 - Supports performance tracking for engagement.
- **Disadvantages:**
 - Does not specifically address number tile puzzle games.

Main Objective

The main goal of **MindGrid: Number Tile Puzzle** is to create a mobile game that not only entertains but also enhances **cognitive abilities** such as **logic, memory, and problem-solving**. The game challenges users to arrange shuffled tiles in the correct sequence using minimal moves and time. It includes features such as:

- A **random tile shuffle** algorithm for varied gameplay.
- **Timer and move counter** to track and improve player performance.
- A **clean, intuitive interface** suitable for all age groups.
- **Performance feedback** to encourage self-improvement.
- Built using **Android Studio** for seamless experience across devices.

Architecture



System Requirements

Hardware Requirements:

- Android smartphone with minimum **2 GB RAM**
- **Quad-core processor** or higher
- Minimum **100 MB** of free storage space
- Screen size: **4.7" or larger** recommended

Software Requirements:

- **Android Studio** (IDE for development)
- **Kotlin** (Programming language)
- **Android SDK** (Version 21 and above)
- **Windows/Linux/macOS** (for development environment)
- **Gradle** (Build tool)

Functional Description

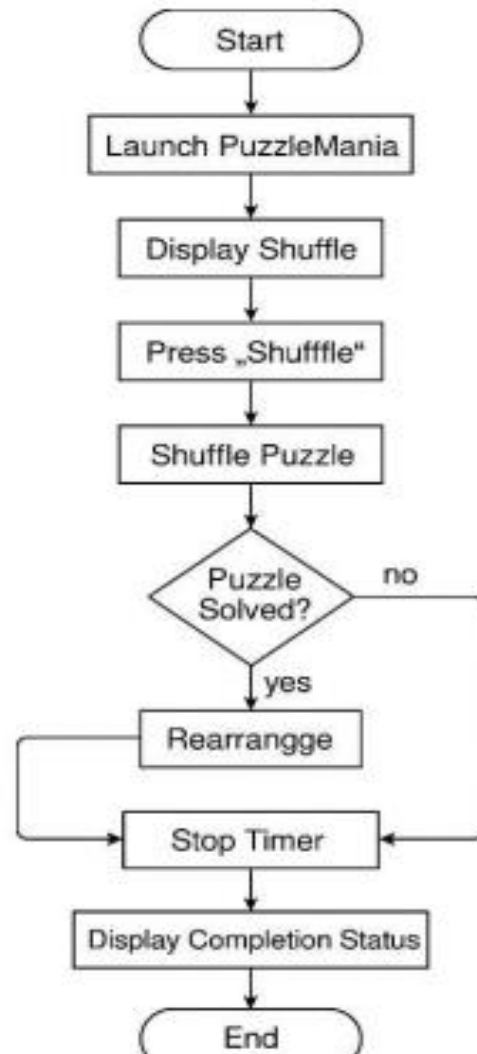
Timer:

- A timer should be implemented to track the time taken to solve the puzzle.
- The timer should start when the game begins and stop when the puzzle is solved.

Win Condition:

- The game should detect when the tiles are in the correct order (1 to 8, with the empty tile at the bottom right).
- A win message should appear when the puzzle is solved, along with the number of moves and time taken.

FLOW DIAGRAM



Implementation

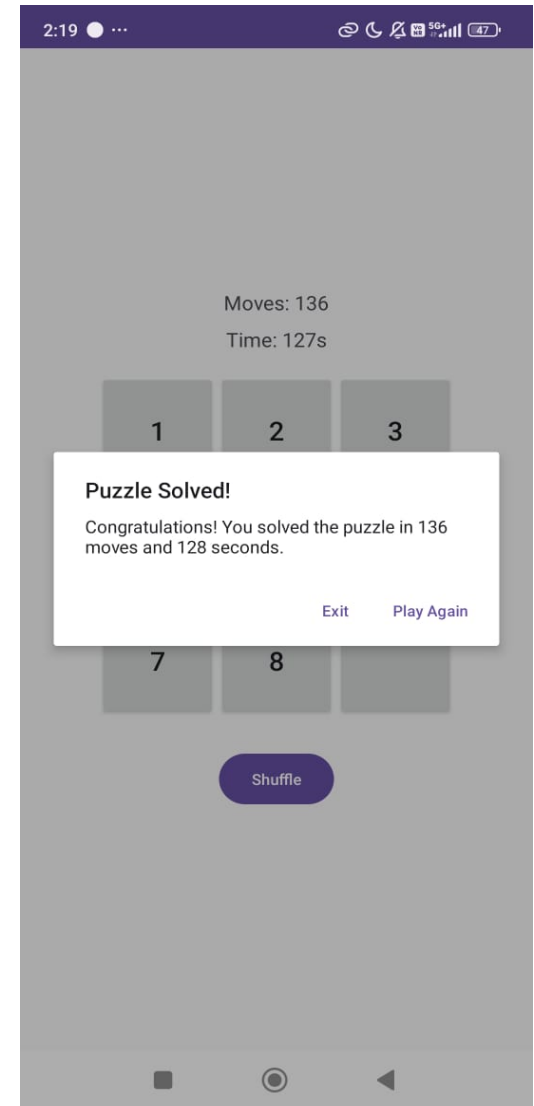
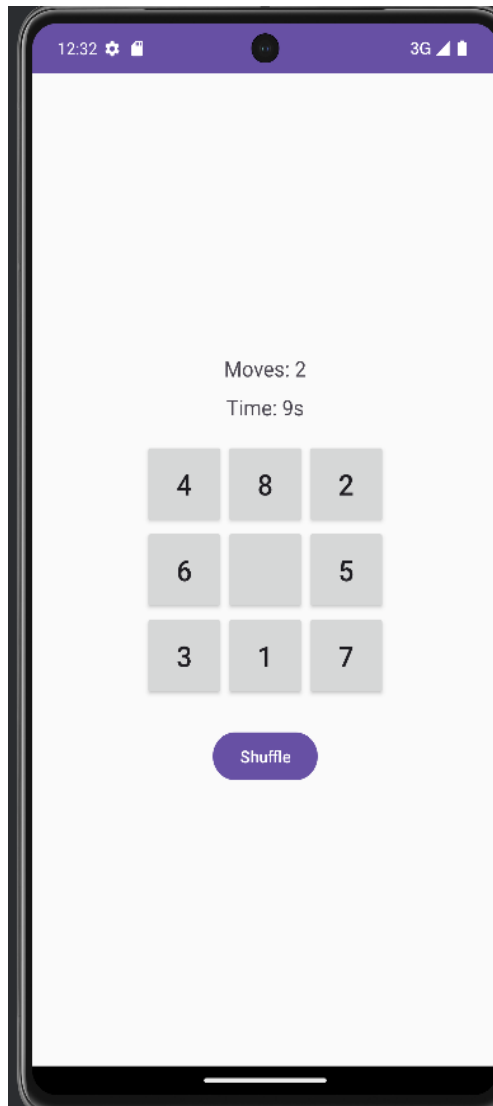
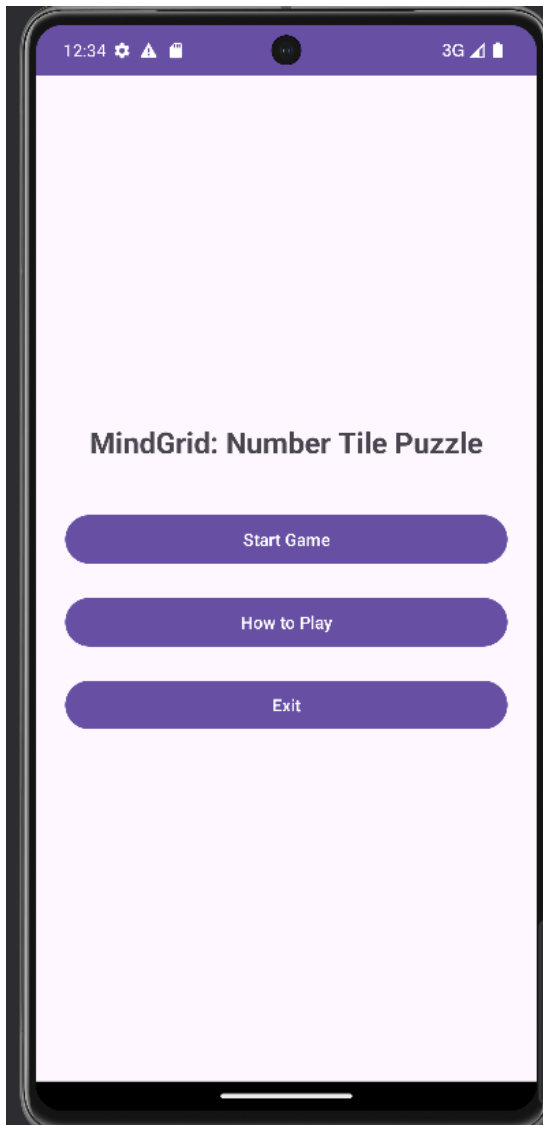
1. Timer Implementation

Use `CountDownTimer` or `Handler` in Android to track the time.

2. Win Condition

To detect when the puzzle is solved, you need to check if the tiles are arranged correctly. Typically, the puzzle should be solved when the tiles are in the order from 1 to 8, with the empty tile at the bottom right.

OUTPUT



Conclusions

- MindGrid: Number Tile Puzzle successfully demonstrates how a simple yet engaging logic-based game can be developed using Android Studio and Kotlin. The project emphasizes critical aspects of mobile app development including intuitive UI design, real-time interaction handling, and user engagement through features like a move counter and timer. By recreating the classic 3x3 sliding puzzle in a digital format, MindGrid not only promotes cognitive skills like logical thinking and pattern recognition but also offers a fun and challenging experience.

Future Enhancement

- **Leaderboard Integration:**

Add global and local leaderboards to encourage competition among users.

- **Multiple Grid Sizes:**

Introduce 4x4, 5x5, and custom grid sizes to increase difficulty Levels

- **Sound Effects & Themes:**

Include background music, sound effects, and customizable themes for a richer user experience.

IEEE Paper

- T. D. Nguyen and H. H. Nguyen, "Designing mobile games for cognitive training: A framework and implementation," *2018 IEEE International Conference on Artificial Intelligence and Virtual Reality (AIVR)*, Taichung, Taiwan, 2018, pp. 166–172. doi: 10.1109/AIVR.2018.00033.
- S. V. Nikolaidis, A. Drosou and A. Tsapatsoulis, "Sliding Puzzle Game Solver for Android Devices," *2019 IEEE Global Engineering Education Conference (EDUCON)*, Dubai, UAE, 2019, pp. 1461–1465. doi: 10.1109/EDUCON.2019.8725112.

References

- [1] T. D. Nguyen and H. H. Nguyen, “Designing mobile games for cognitive training: A framework and implementation,” *2018 IEEE International Conference on Artificial Intelligence and Virtual Reality (AIVR)*, Taichung, Taiwan, 2018, pp. 166–172, doi: 10.1109/AIVR.2018.00033.
- [2] S. V. Nikolaidis, A. Drosou and A. Tsapatsoulis, “Sliding Puzzle Game Solver for Android Devices,” *2019 IEEE Global Engineering Education Conference (EDUCON)*, Dubai, UAE, 2019, pp. 1461–1465, doi: 10.1109/EDUCON.2019.8725112.
- [3] A. Aggarwal and K. Kumar, “Development of Educational Games on Android Platform,” *2017 International Conference on Computing, Communication and Automation (ICCCA)*, Greater Noida, India, 2017, pp. 1046–1050, doi: 10.1109/CCAA.2017.8229953.

Queries...?

Demonstration

Thank You...!