RISC-V 32I Sokoban Game Documentation

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1 Introduction

Welcome to the Sokoban game on RISC-V 32I using an 8x8 LED-Matrix and a D-Pad! This document serves as a comprehensive guide to help you understand and enjoy the features of the game. The particular enhancements made to this game is a multiplayer feature and a randomizer that randomly generates the positions of the player, box, and target.

2 Game Overview

Sokoban is a classic puzzle-solving game where players navigate a character to push boxes onto target locations. The RISC-V 32I architecture, Ripes simulator, LED-Matrix, and D-Pad are utilized to create an engaging gaming experience. Key features include:

- Competitive mode for multiple players.
- LED-Matrix for visual representation of the game board.
- WASD keys linked to arrow buttons on a D-Pad for user input.
- Randomized puzzles using the Linear Congruential Generator (LCG) formula.
- Player standings board after each round for multiplayer mode.

3 Game Elements

3.1 LED-Matrix Representation

Below is a mapping of the colors to what they represent

- **Walls:** Maroon
- **Player:** Light Purple

- **Box:** Brown
- **Empty spaces:** Black
- **Target:** White

3.2 D-Pad Input

Press the WASD keys to navigate your character:

- **W:** Move Up
- **A:** Move Left
- **S:** Move Down
- **D:** Move Right

Accordingly, you may also directly click the D-Pad buttons for control on the D-Pad window.

4 Gameplay

4.1 Starting a Game

- The game begins in competitive mode.
- Enter the number of players when prompted.
- All players receive the same puzzle for fairness.

4.2 Randomized Puzzles

The game utilizes the LCG formula with parameters 75 and 74. The `randLCG` function is called with the system time as the seed to ensure puzzle randomness.

4.3 Board Initialization

The `boardINIT` function sets up the LED-Matrix:

- All LEDs start as black.
- The edges of the game board are colored maroon.

4.4 Game Flow

- Players take turns navigating the character and pushing boxes.
- After each turn, the console displays "NEXT PLAYER'S TURN!"
- Once all players complete their turns, a standings board is printed.

4.5 Special Situations

- If a player pushes a box into a corner, the game prompts the player to restart.
- Enter 0 to end the game, and 1 to restart the current puzzle.

4.6 Victory

- When a player successfully places the box onto the target, a success message is displayed in the console.

4.7 Game Flow

The game operates on a turn-based system where players take turns navigating the character using the WASD keys linked to arrow buttons on a D-Pad. The game flow is controlled by the main loop, which processes user input and updates the LED-Matrix accordingly.

- **Movement:** Players use the WASD keys to move the character on the LED-Matrix. Walls, represented by maroon, constrain movement.
- **Box and Target Placement:** The initial placement of the box and target is randomized using the Linear Congruential Generator (LCG) formula. The box is represented in brown, and the target is represented in white. Players need to strategically move the box onto the target to complete the puzzle.
- **Game Loop:** The game runs in a loop, allowing players to make moves one at a time. After each move, the LED-Matrix is updated to reflect the new positions of the character, box, and target. The loop continues until a player successfully completes the puzzle or decides to restart or exit the game.
- **Player Turns:** In multiplayer mode, each player takes turns making moves. The number of players and their individual standings are tracked.

5 Conclusion

Congratulations on exploring the features of Sokoban on RISC-V 32I using an LED-Matrix and a D-Pad! Should you encounter any issues or wish to provide feedback, feel free to contact us. Enjoy the game!