SOKOBAN

USER GUIDE

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ABOUT THE GAME

INTRODUCTION

Do you have what it takes to outsmart a single box?

Welcome to Sokoban, the ultimate puzzle game where brains trump brawn! Your mission? Navigate through the grid and push the lone box (B) onto its target (X). But be warned — there's a twist: you can only push the box, not pull it. One wrong move, and you might trap the box in a corner, leaving you stuck!

Sokoban isn't just a game; it's a test of your strategic thinking and patience. Whether you're playing alone or challenging a friend, every move matters. Can you conquer the puzzle, or will a single box get the better of you?

HOW TO SET UP

SETTING UP THE GAME

To get started with Sokoban, follow these simple steps to set up the game:

(1) Open the Sokoban.s File:
- Locate the Sokoban.s file provided to you.

(2) Copy the Code:
- Open the Sokoban.s file and press CTRL + A (Windows/Linux) or Command + A (Mac) to select all the code.
- Now press CTRL + C (or Command + C) to copy the selected code.

(3) Open the CPulator:
- Go to https://cpulator.01xz.net/?sys=rv32-spim.

(4) Paste the Code into the Editor:
- On the CPulator website, locate the code editor (it opens in the center of the screen by default).
- Click inside the editor and press CTRL + A (or Command + A) to select any existing text.
- Press CTRL + V (or Command + V) to paste the entire Sokoban code you copied earlier.

(5) Compile and Load the Game:
- After pasting the code, press F5 or click Compile and Load to load the game into the simulator.

(6) Start the Game:
- Once the code is loaded, click Continue (F3) to run the game.

(7) Interact with the Game:
- A welcome message will appear in the Terminal window on the right side of the editor.
- You'll be prompted to choose the game mode, and the game will guide you from there.
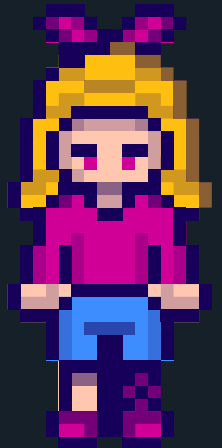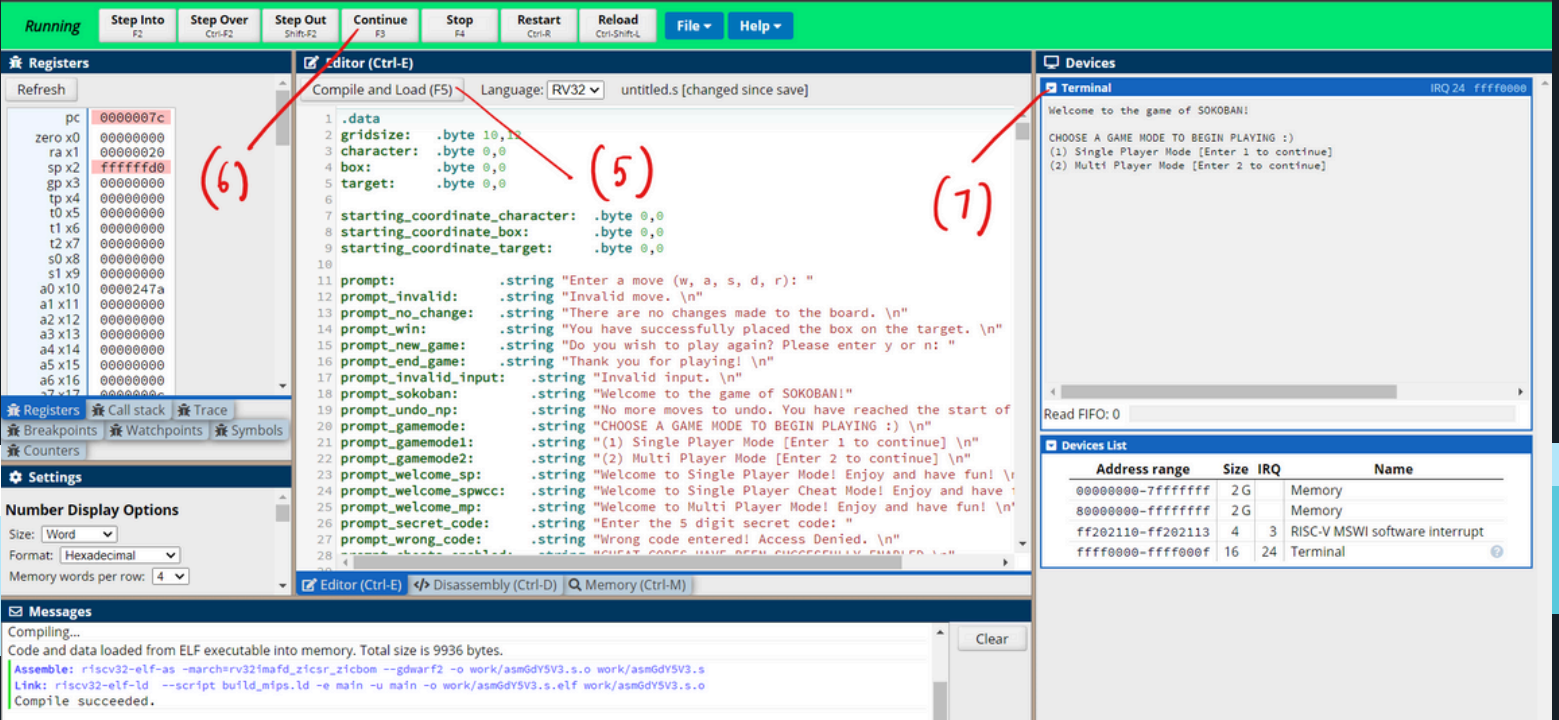
Figure 1.01 This is how the CPUlator should look like after it is set up

GAME OVERVIEW

OBJECTIVE

The objective of Sokoban is to navigate your character and push the box onto the target using strategic moves. Since you can only push the box, not pull it, every move counts. Plan carefully to avoid getting the box stuck and complete the puzzle as efficiently as possible!

CHOOSING A GAME MODE

SINGLE PLAYER MODE
Press 1 to play

In this mode, one player controls the character and takes on the puzzle independently. The player must push the box to the target with minimal moves and no assistance. This mode is perfect for honing your problem-solving skills and challenging yourself.

MULTI PLAYER MODE
Press 2 to play

In this mode, two or more players take turns controlling the character. Each player must make smart moves during their turn to get the box to the target. The game tracks whose turn it is by displaying the player's name. This mode adds another layer of difficulty as players can compete, and whoever makes the fewest moves on their turn wins bragging rights!

KEY SYMBOLS

```
(1) B :   box
(2) C :   character
(3) X :    target
(4) + :    wall
(5) _ :    floor
```

Figure 1.02 RepresentS the Single Player Mode

Figure 1.03 Represents the Multi Player Mode

HOW TO PLAY

HOW TO MOVE

Use the following controls to move your character on the board:

- W – Move up
- A – Move left
- S – Move down
- D – Move right
- R – Restart the game

WARNING: Make sure to turn off the CapsLk if on since the moves only work with lowercase letters.

GAME RULES

(1) Box Movement:
- The box (B) can only be moved by pushing, not pulling. You must push the box to the target (X) to complete the puzzle and win the game.

(2) Edge Cases:
- Walls (represented by +) block both the character and the box. If a move attempts to push the box or move the character into a wall, it will be invalid.

(3) Restarting the Game:
- If you get stuck, press R to reset the board to its original state and try again.

(4) Winning Condition:
- The player wins when the box is successfully pushed to the target location, completing the puzzle.

Figure 1.04 Represents how the character moved down after input s

```
+_____+
++++++++++++


Enter a move (w, a, s, d, r): r
Are you sure you wish to reset? Please enter y or n: y


++++++++++++
+___B__X___+
+__C_____+
+_____+
+_____+
+_____+
+_____+
+_____+
+_____+
++++++++++++


Enter a move (w, a, s, d, r):
```

Read FIFO: 0
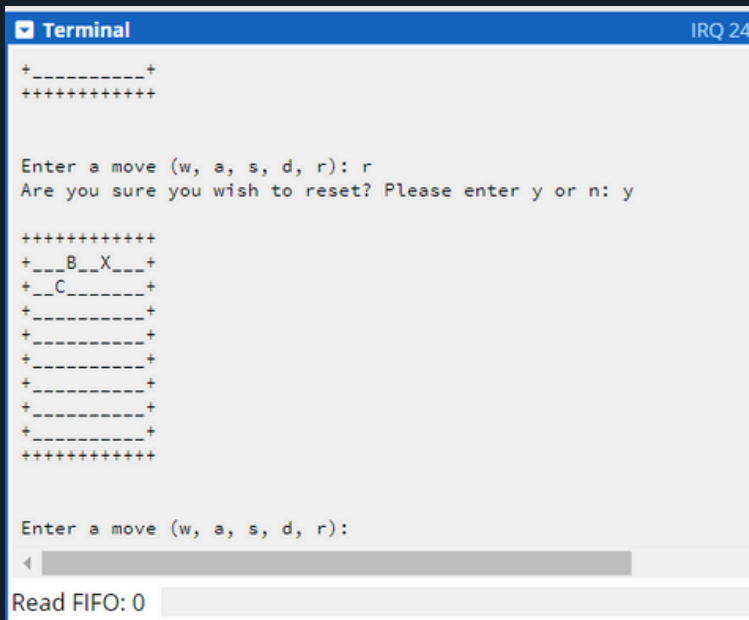
Figure 1.05 Represents the state of game after reset

```
+_____+
++++++++++++


Enter a move (w, a, s, d, r): w
++++++++++++
+_____+
+_____B+
+_____C+
+_____+
+_____+
+_____+
+_____+
+_____+
+_____+
++++++++++++


You have successfully placed the box on the target.

Do you wish to play again? Please enter y or n: █
```
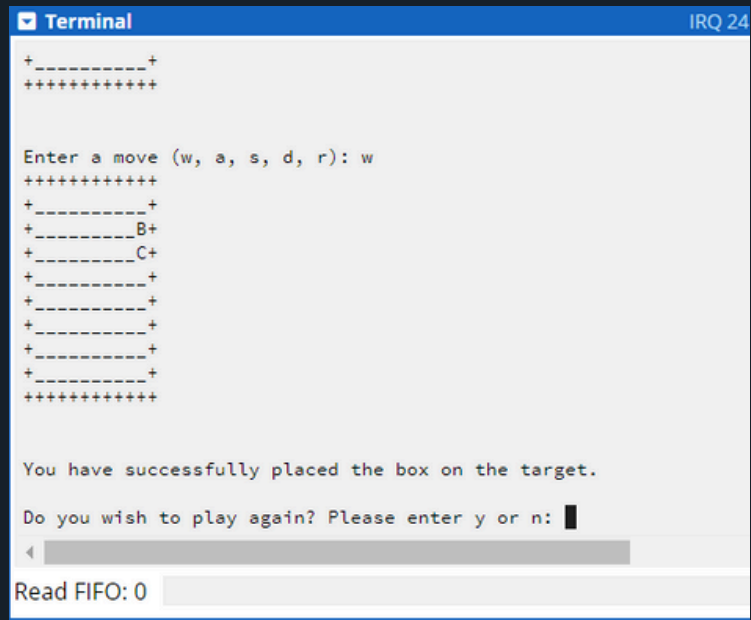
Read FIFO: 0

Figure 1.06 Represents the state of game after a successful win

GAME MECHANICS

HANDLING ERRORS

(1) INVALID MOVE

Error Message: Invalid Move.

If a move is not allowed (e.g., entering a move which is not supported by the game), the game will display "Invalid move." Review your strategy and try a different move.
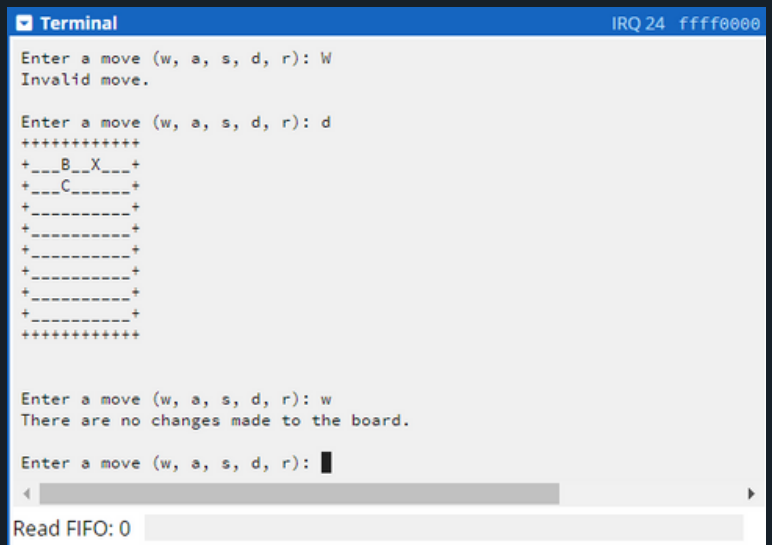
```
Enter a move (w, a, s, d, r): W
Invalid move.

Enter a move (w, a, s, d, r): d
++++++++++++
+___B__X___+
+___C_____+
+_____+
+_____+
+_____+
+_____+
+_____+
+_____+
++++++++++++


Enter a move (w, a, s, d, r): w
There are no changes made to the board.

Enter a move (w, a, s, d, r): █
```

Read FIFO: 0

Figure 1.07 Represents the error for invalid move

(2) UNCHANGED GAME BOARD

Error Message: There are no changes made to the board.

If your move doesn't affect the game state, you'll see "There are no changes made to the board." Check if you're trying to push the box when blocked or moving into an empty space.

```
Enter a move (w, a, s, d, r): d
++++++++++++
+___B__X___+
+___C_____+
+_____+
+_____+
+_____+
+_____+
+_____+
+_____+
++++++++++++


Enter a move (w, a, s, d, r): w
There are no changes made to the board.

Enter a move (w, a, s, d, r): h
Invalid move.

Enter a move (w, a, s, d, r): █
```

Read FIFO: 0

Figure 1.08 Represents the error for unchanged gameboard

GAME MECHANICS

PLAYING AGAIN AFTER A WIN

After winning the game, you'll receive a prompt asking if you wish to play again.

(1) If you enter 'y': A new game will begin, resetting the board with a fresh setup.

(2) If you enter 'n': A thank you message will be displayed, and the game will end.

(3) Any other input, will cause an invalid input error

Enjoy the challenge as many times as you want, or take a break and return later for more fun!

Figure 1.09 Represents the user quitting the game

RESTARTING THE GAME

If you encounter any issues while playing, such as errors displayed in the message section at the bottom-left of the CPUlator screen, you can restart the game to try again.

Additionally, if the player chooses to exit the game by pressing 'n' when prompted to play again, the game will end—but you can still restart it to continue playing.

This process ensures that the game is properly reset, allowing you to play without interruption or issues.
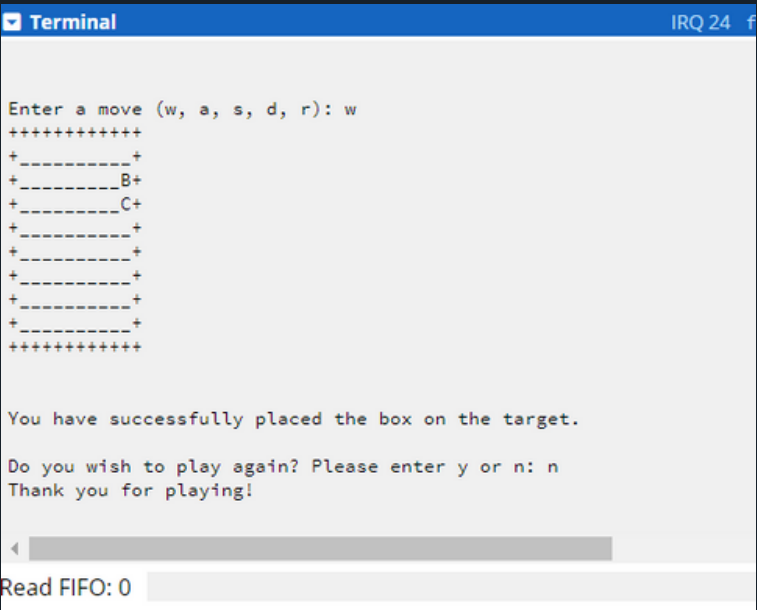
To restart the game:

(1) Go to the Restart Button: Click the Restart (CTRL + R) button at the top of the CPulator screen.

(2) Clear the Terminal: Hover over the small dropdown at the top-right of the Terminal window (on the right side of the screen), then select Clear Terminal from the menu.

(3) Click Continue (F3): After restarting, click Continue (F3) at the top of the screen to begin a new game.
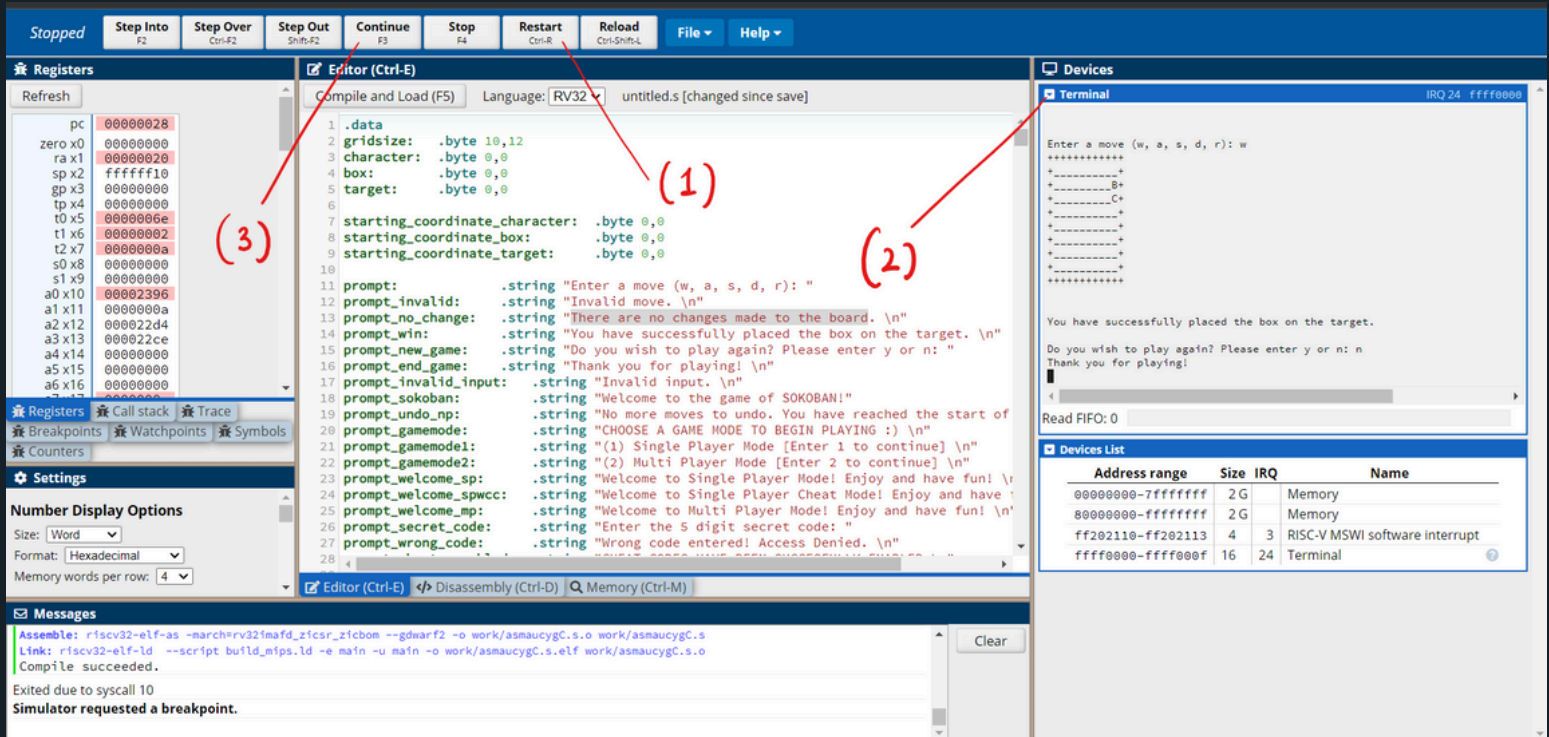

Figure 1.10 Represents the user restarting the game after it ended when the user entered 'n' to not play again

ADDITIONAL FEATURES

CHANGING THE DEFAULT GRID SIZE

You can customize the size of the game's grid by adjusting the dimensions directly in the code. Follow these steps to modify the grid size:

(1) Locate the Grid Size in the Code:
- Look into the editor in the CPUlator and look for the following lines near the top:
- gridsize: .byte 8,8
- These two numbers represent the number of rows and columns of the grid.

(2) Modify the Dimensions:
- Change the numbers to your desired values.
- For example:
- gridsize: .byte 10,12 will create a grid with 10 rows and 12 columns.

(3) Understand the Playable Area:
- The outer edges of the grid are walls that block movement.
- The playable area inside the grid will be (m - 2) x (n - 2), where m is the number of rows and n is the number of columns.
- For instance, a grid size of 8x8 gives a playable area of 6x6.

(4) Compile and Load:
- After making your changes, press Compile and Load (F5) in the CPulator to load the updated code.

(5) Continue:
- Then click Continue (F3) to start the game with the new grid size.

Following these steps will allow you to explore different grid configurations and tailor the game to your liking!
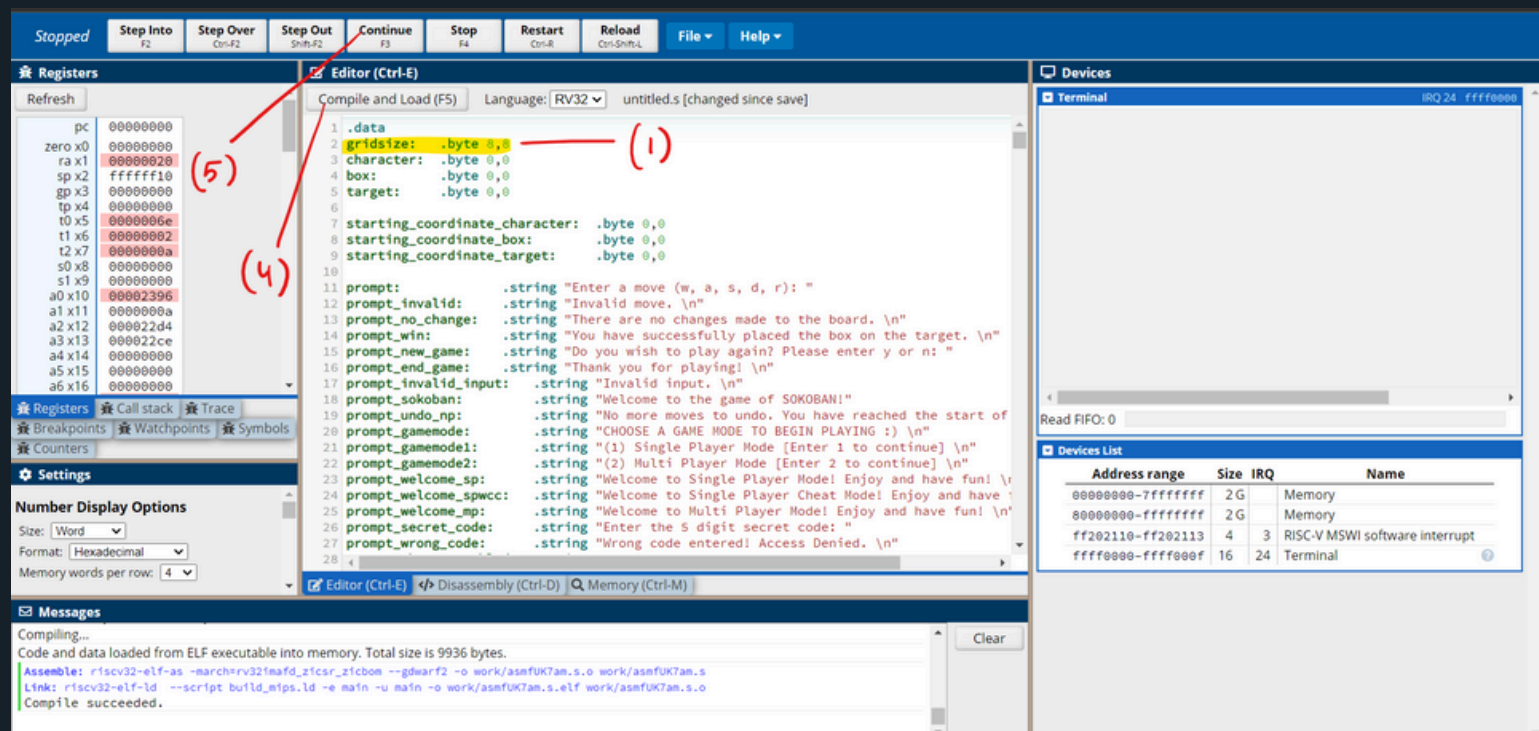
Figure 1.11 Represents the user being able to change the grid size to the desired values

MODIFY SYMBOLS

You can customize the symbols used in the game by simply changing them to any desired character on the keyboard in the editor section of the CPUlator. After making your changes, press Compile and Load (F5) in the CPulator to load the updated code. Then click Continue (F3) to start the game with the new grid size.

Figure 1.12 Represents the user being able to change the symbols on the board to any desired characters

SECRET SINGLE PLAYER MODE WITH CHEAT CODES

The game features a special single-player mode with cheat codes, accessible only when prompted to select a game mode.
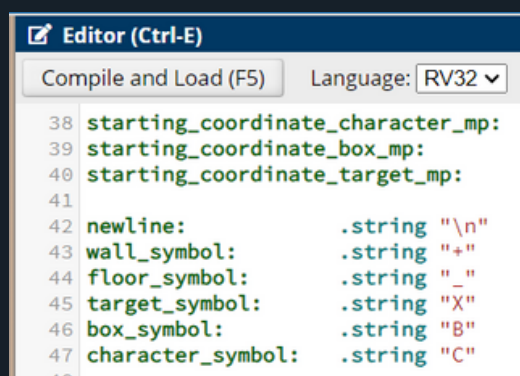
This cheat-enabled mode adds a layer of excitement for players looking for an extra challenge or a fun way to explore the game mechanics!

> *WARNING: You can only press 'e' and attempt this mode when explicitly asked to choose a game mode. If you try to press 'e' at any other time, it won't be recognized, and would return in an invalid move.*

CHEAT CODES

(1) u :   Unlimited Undo
(2) t :   Teleport
(3) x :   Instant Win
(4) i :   Portal / Move up
(5) j :   Portal / Move left
(6) k :   Portal / Move down
(7) l :   Portal / Move right

UNLIMITED UNDO

This feature allows the player to undo any number of moves made during the game, up until the board has been reset. Note that once the player resets the board, the undo functionality becomes unavailable, and all previous moves are cleared.

INSTANT WIN

This cheat immediately moves the box to the target, granting the player an instant victory for the level.

FIND THE SECRET CODE ON THIS USER GUIDE'S TITLE PAGE
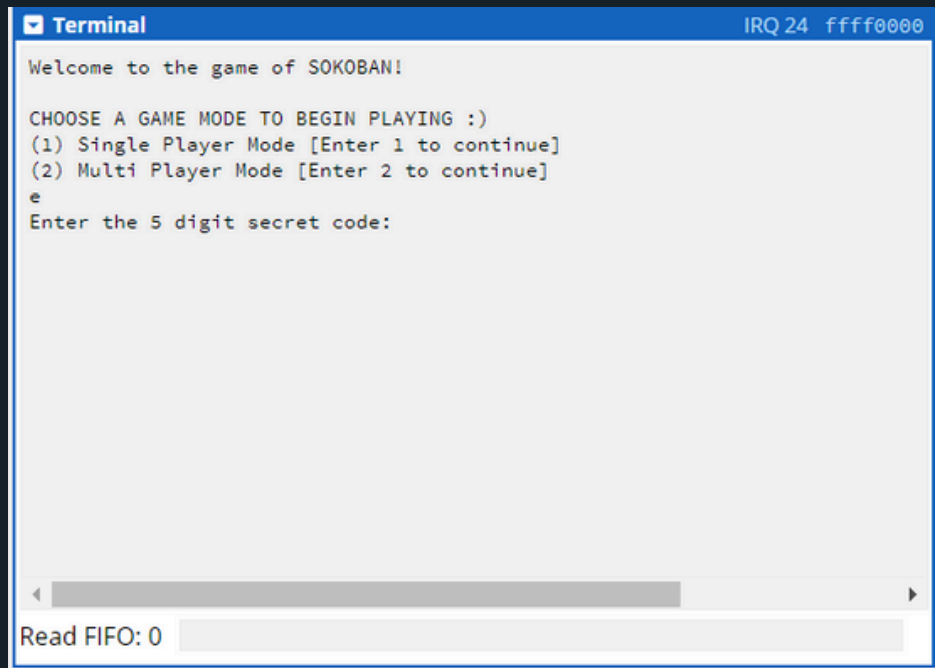
Here's how it works:

(1) Choosing the Cheat Mode:
- When the game asks you to choose between single-player and multiplayer modes, press 'e' to enter the secret mode.

(2) Entering the Secret Code:
- After pressing 'e', you'll be prompted to enter a 5-digit secret code.
- If you enter the correct code, you'll unlock cheats for that round of the single-player mode, giving you an advantage in solving the puzzle.

(3) Invalid Code Handling:
- If the code you enter is incorrect, the game will prompt you to select the game mode again, allowing you to either re-enter the cheat mode or proceed with the regular single or multiplayer options.


```
🖥 Terminal                                    IRQ 24  ffff0000

Welcome to the game of SOKOBAN!

CHOOSE A GAME MODE TO BEGIN PLAYING :)
(1) Single Player Mode [Enter 1 to continue]
(2) Multi Player Mode [Enter 2 to continue]
e
Enter the 5 digit secret code:



◄                                                        ►
Read FIFO: 0
```

Figure 1.13 Represents when the user enters the cheat mode and is prompted to enter the secret code

TELEPORT

This feature allows the character to teleport directly over the target. While the character is on the target, the board will initially display only the character and the box. To reveal the target, the character must move from its position.

PORTAL MOVEMENT

With this cheat enabled, the character and box can move in all directions without restrictions.The player can also move through walls, bypassing the normal movement limitations of the game.

.

```
Terminal                                                          IR
(1) Single Player Mode [Enter 1 to continue]
(2) Multi Player Mode [Enter 2 to continue]
e
Enter the 5 digit secret code: ~~55655~~

CHEAT CODES HAVE BEEN SUCCESFULLY ENABLED

Welcome to Single Player Cheat Mode! Enjoy and have fun!


++++++++
+__C___+
+_____+
+_____+
+_____+
+B_____+
+X_____+
++++++++


Enter a move (w, a, s, d, r):

◄
Read FIFO: 0
```

Figure 1.14 Represents when the user enters the correct secret code

```
Terminal
Welcome to the game of SOKOBAN!

CHOOSE A GAME MODE TO BEGIN PLAYING :)
(1) Single Player Mode [Enter 1 to continue]
(2) Multi Player Mode [Enter 2 to continue]
e
Enter the 5 digit secret code: 66666

Wrong code entered! Access Denied.


CHOOSE A GAME MODE TO BEGIN PLAYING :)
(1) Single Player Mode [Enter 1 to continue]
(2) Multi Player Mode [Enter 2 to continue]
█

◄
Read FIFO: 0
```

Figure 1.15 Represents when the user enters the wrong secret code

```
Terminal                                               IRQ 24  fff
Enter a move (w, a, s, d, r): i
++++++++
+___B__+
+___C__+
+_____+
+_____+
+_____+
+X_____+
++++++++


Enter a move (w, a, s, d, r): i
++++++++
+___C__+
+_____+
+_____+
+_____+
+_____+
+X__B__+
++++++++

◄
Read FIFO: 0
```

Figure 1.16 Represents when the user uses portal up and pushes the box through the wall.

```
Terminal                                               IRQ 24  f
Enter a move (w, a, s, d, r): k
++++++++
+_____+
+_____+
+___B__+
+_____+
+____C_+
+X_____+
++++++++


Enter a move (w, a, s, d, r): t
++++++++
+_____+
+_____+
+___B__+
+_____+
+_____+
+C_____+
++++++++

◄
Read FIFO: 0
```

Figure 1.17 Represents when the user teleport to move the character to the target

```
Terminal                                               IRQ 24  ff
Enter a move (w, a, s, d, r): a
++++++++
+_____+
+_____+
+___B__+
+_C____+
+_____+
+X_____+
++++++++


Enter a move (w, a, s, d, r): u
++++++++
+_____+
+_____+
+___B__+
+__C___+
+_____+
+X_____+
++++++++

◄
Read FIFO: 0
```

Figure 1.18 Represents when the user uses unlimited undo

```
Terminal                                               IRQ 24  f
+__C___+
+_____+
+X_____+
++++++++


Enter a move (w, a, s, d, r): x
++++++++
+_____+
+_____+
+_____+
+__C___+
+_____+
+B_____+
++++++++


You have successfully placed the box on the target.

Do you wish to play again? Please enter y or n:

◄
Read FIFO: 0
```

Figure 1.19 Represents when the user uses instant win

MULTIPLAYER MODE

In multiplayer mode, the game begins by prompting the user to enter the number of players participating. Once a valid input is received, the game prompts each player, one by one, to enter their name. After a player provides their name, they proceed to play their round. This process continues sequentially until all players have completed their turns.

Once all players have finished, a leaderboard is displayed in the terminal, ranking the players by their number of moves. The player with the fewest moves appears at the top of the leaderboard, while the player with the most moves is listed at the bottom.

After the leaderboard is shown, the game prompts the players to decide if they wish to continue playing. If they choose to do so, a new game begins; otherwise, the session ends.

```
Terminal
(1) Single Player Mode [Enter 1 to continue]
(2) Multi Player Mode [Enter 2 to continue]
2

Welcome to Multi Player Mode! Enjoy and have fun!

Enter the number of players who wish to play: 3

Enter a name for the player [MAX 3 CHARACTERS]: bob
++++++++
+__C___+
+_____+
+_____+
+_____+
+B_____+
+X_____+
++++++++


Enter a move (w, a, s, d, r): █

Read FIFO: 0
```
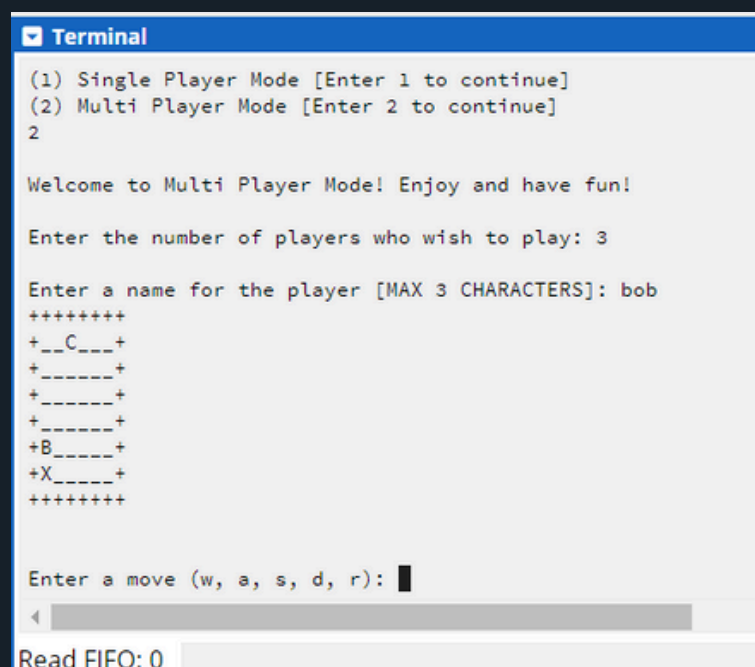
Figure 1.20 Represents when the user is playing multiplayer mode and is prompted to enter the number of players and the player name for every player.
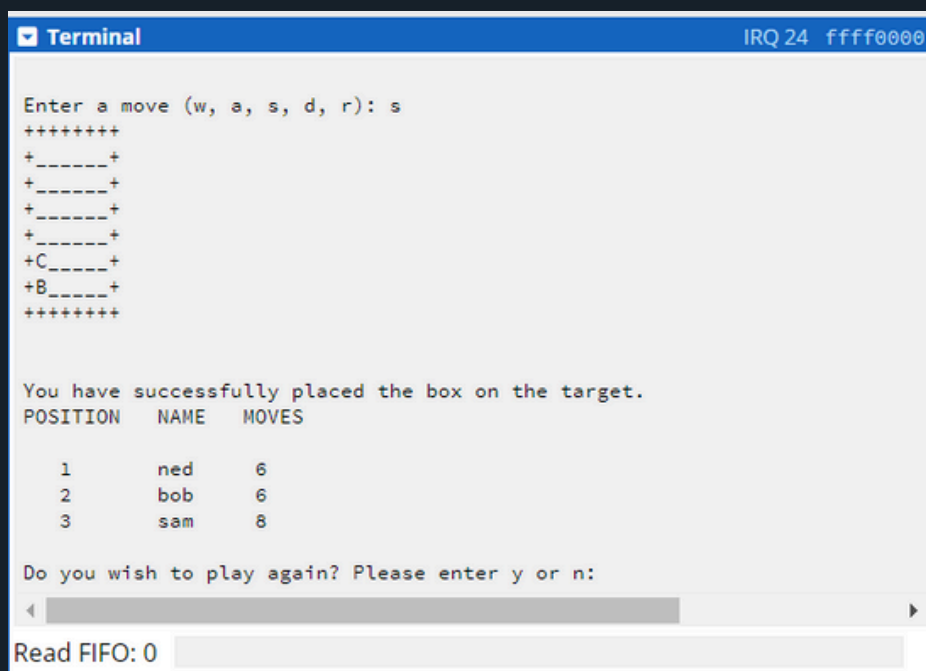
```
Terminal                                    IRQ 24  ffff0000

Enter a move (w, a, s, d, r): s
++++++++
+_____+
+_____+
+_____+
+_____+
+C_____+
+B_____+
++++++++


You have successfully placed the box on the target.
POSITION    NAME    MOVES

    1        ned      6
    2        bob      6
    3        sam      8

Do you wish to play again? Please enter y or n:

Read FIFO: 0
```

Figure 1.21 Represents the leaderboard after the all the players have played in the multiplayer mode

CONCLUSION

Thank you for playing Sokoban! I hope this user guide has provided you with all the information you need to enjoy the game to its fullest. Whether you've challenged yourself in single-player mode, teamed up with friends in multiplayer mode, or explored the thrill of cheat codes, every move counts toward mastering the puzzle. Enjoy your journey through Sokoban, and may every puzzle be a satisfying challenge! Happy playing! 🎮