Sokoban User Guide

Requirement:

Website: CPUlator[1]

Number of Players: 1 Player

Playing Time: Approximately 1 minutes

Age: 3+

Eric Wang

University of Toronto

CSC258 Assembly Project

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[1] A website that can run RISC-V Assembly. https://cpulator.01xz.net/?sys=rv32-spim

Outline

Chapter 1 : Introduction

Welcome to the Sokoban Game ! Sokoban (which means "warehouse keeper" in Japanese) is a puzzle video game originally developed in 1981 by Hiroyuki Imabayashi[2]. Released in 1982 by the Japanese company Thinking Rabbit[3], Sokoban became widely popular for its simple yet challenging gameplay. It's often cited as one of the quintessential "pushing" puzzle games that inspired future puzzle game mechanics (FIGURE 1.1).

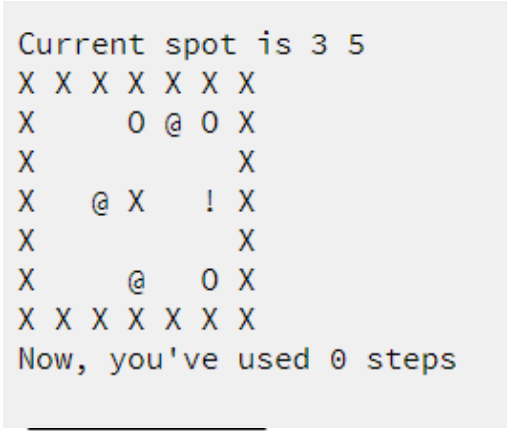

FIGURE 1.1 Sokoban game

Progressing through the game requires careful **planning** and precise **maneuvering**. A single mistake, such as pushing a box into a corner or obstructing the path of others, can render the puzzle unsolvable, forcing the player to backtrack or restart. FIGURE 1.2 on the right shows if the two boxes are connected and against a wall, the game is unsolvable. So this is a bad strategy!!!

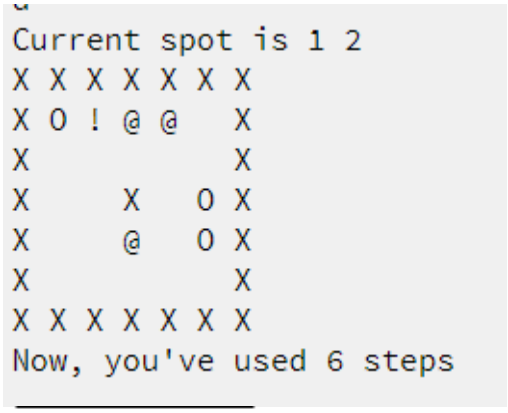

FIGURE 1.2 Bad strategy

Let's start learning how to play Sokoban and some basic game strategies!

[2] Hiroyuki Imabayashi (born circa 1960) is a former video game developer and programmer.

[3] Thinking Rabbit was a software house based in Takarazuka, Japan, best known for being the original publishers of Sokoban.

Chapter 2 : Game Setup

Step 1: Open CPUlator[4]

First, Look at FIGURE 2.1, put the link https://cpulator.01xz.net/?sys=rv32-spim into any browser(for example: Google)

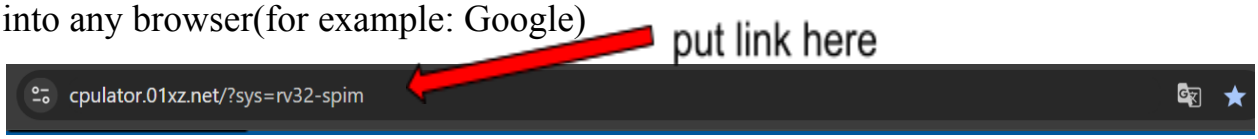

FIGURE 2.1 Open CPUlator

Step 2: Copy Code and Load Game

Second, download my code and you can see this file on your computer.(FIGURE 2.2) Then copy anything in the file (ctrl + c to copy).

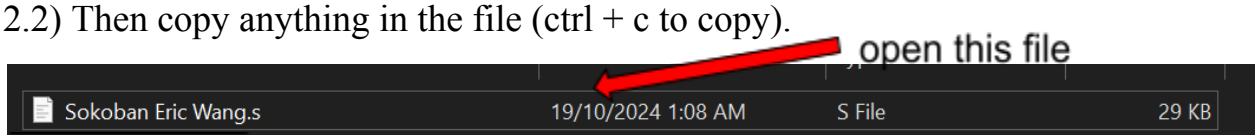

FIGURE 2.2 Open the file

After then, look at FIGURE 2.3, paste (ctrl + v to paste) code on the cpulator and click Complie and Load (F5). Then, you need to click Continue.

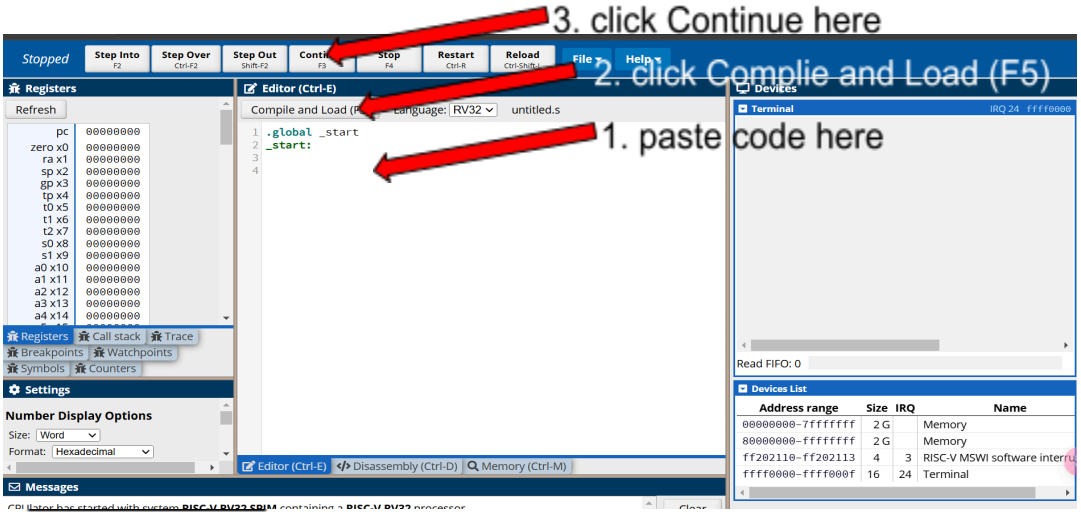

FIGURE 2.3 Copy and load the game

[4] A website that can run RISC-V Assembly. https://cpulator.01xz.net/?sys=rv32-spim (Make sure you can find the right website.)

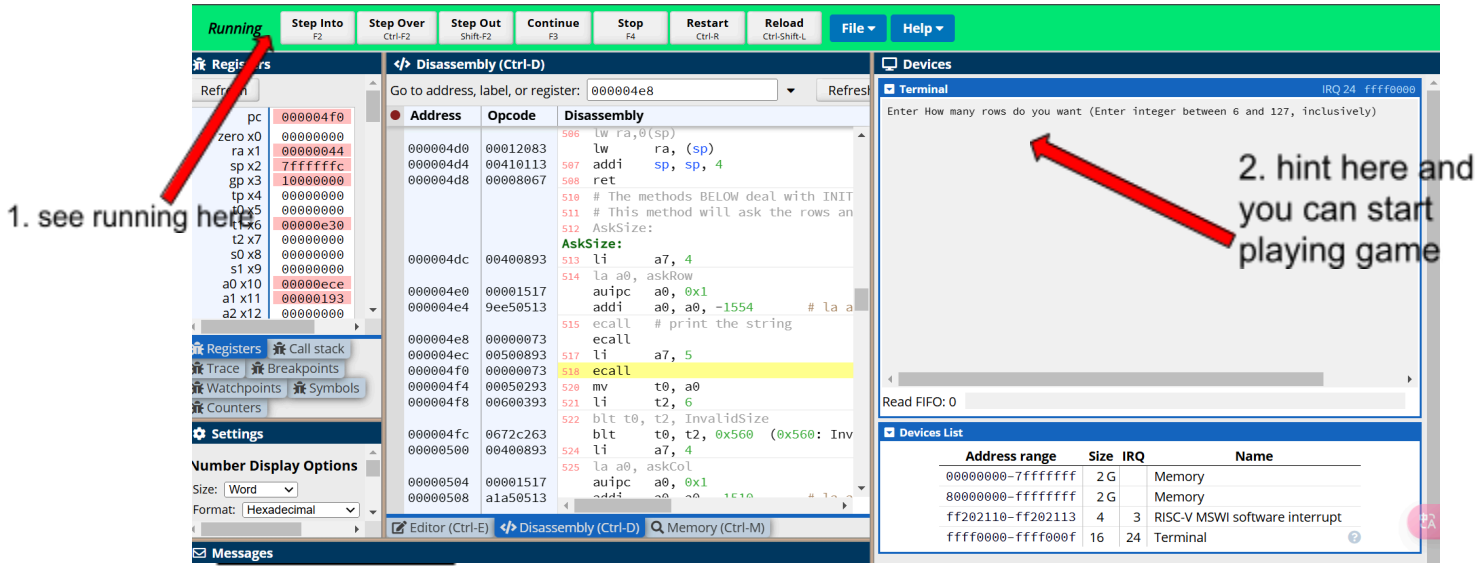

FIGURE 2.4 The start of game

Finally, look at FIGURE 2, you could see “runing” in the most upper left and there is a line of hint in the **terminal**[5]. Congratulations! You could play the game at the right terminal !

[5] A terminal is a text-based interface used to interact with a computer's operating system. It allows users to input commands directly and receive text-based output

Chapter 3 : Game Play

3.1 Get to know items

There are 5 different items in the game:

"X" is the symbol for the **wall**. No other object can pass through the wall and the wall is **immovable**.

"@" is the symbols for the **box**, boxes are **movable** and you need to push all the boxes to all the targets to win.

"O" is the symbol for the **target**, which is **immovable**, and you need to push all the boxes to all the targets to win.

"!" is the symbol for the **character**, which is **movable**, and the character can push the box, but not the wall.

" " is **empty**, where there's nothing, the **boxes** and the **characters** can move here.

3.2 Restrictions (The things you have to know before game)

At the beginning of the game, the terminal will ask you for the **size** of the game board. (FIGURE 3.1) Please input the size and **press enter**.

```
Enter How many rows do you want (Enter integer between 6 and 127, inclusively)
6
Enter How many cols do you want (Enter integer between 6 and 127, inclusively)
6
Valid size, Game Start!!!
Enter difficulty of the game! (Please press 1, 2 or 3)
```

FIGURE 3.1 Restrictions of game

Please note that you need to enter an **integer** between 6 and 127 ! ! ! If it's less than 6, you will be asked to input it again. (If the game board is too big, it will exceed the range of signed integers).

```
Enter How many rows do you want (Enter integer between 6 and 127, inclusively)
50
Enter How many cols do you want (Enter integer between 6 and 127, inclusively)
50
Valid size, Game Start!!!
Enter difficulty of the game! (Please press 1, 2 or 3)
3

Current spot is 16 22
X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X
X                                                                                                 X
X                                                                                                 X
X     X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X       X
X     X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X       X
X     X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X       X
X     X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X       X
X     X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   @   X
X     X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X   X       X
```

FIGURE 3.2 Maximum of column

Look at FIGURE 3.2, it is **RECOMMENDED** that you do not enter more than 50 cols[6], because the **width of the terminal** is 50. The cols will display incorrectly if the number of cols exceeds 50.

The terminal will ask you the difficulties you want to play. Please input 1, 2 or 3 and **press enter**, if it's anything else you will be asked to input it again.

Let us see the FIGURE 3.3,
Level 1 has **no internal walls,**
and has only **one box** and **one target**.

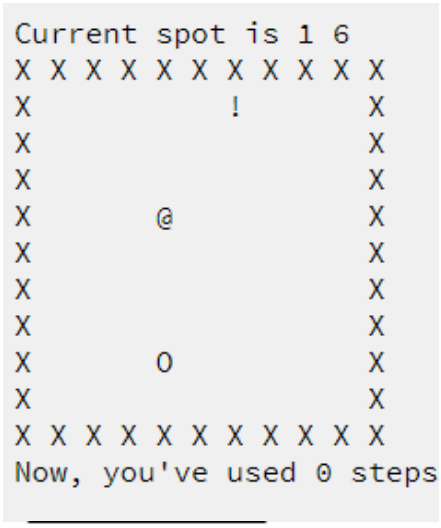

FIGURE 3.3 Difficulty 1

Let us see the FIGURE 3.4,
Level 2 has a **cross wall** in the center,
and **two boxes** and **two targets**.

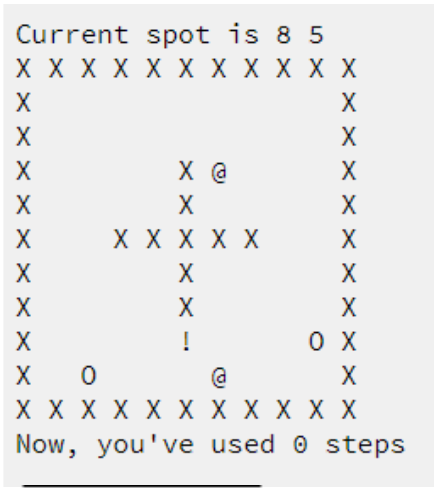

FIGURE 3.4 Difficulty 2

[6] Abbreviations for columns

Let us see the FIGURE 3.5,

Level 3 has **striped walls**,

and **three boxes** and **three targets**.

```
Current spot is 5 1
X X X X X X X X X X
X         O @       X
X                   X
X @   X   X   X     X
X     X   X   X     X
X !   X   X   X     X
X     X   X   X     X
X O   X   X   X     X
X                   X
X           O   @   X
X X X X X X X X X X
Now, you've used 0 steps
```

FIGURE 3.5 Difficulty 3

If the generated grid is relatively small (rows or cols less than 9), the walls will be **incomplete**.

3.3 Game Start

The top of the board is the **current character's position** (rows and cols starting from 0). (FIGURE 3.6)

There is the **number of moves** that have been used below the board.

```
Current spot is 4 4
X X X X X X X X X X
X       @   O       X
X   @               X
X     X   X   X     X
X     X ! X   X   O X
X     X   X   X     X
X     X   X   X     X
X     X   X   X   @ X
X     O             X
X                   X
X X X X X X X X X X
Now, you've used 0 steps
```

FIGURE 3.6 Display of gameboard

The game has started, and pressing different buttons will trigger **different responses**. (FIGURE 3.7)

If we press **w**, the character will move **up**.

if we press **a**, the character will move **left**.

if we press **s**, the character will move **down**..

if we press **d**, the character will move **right**.

```
Please press valid button
w: move up
a: move left
s: move down
d: move right
b: roll back to previous step
r: reset the game
```

FIGURE 3.7 Control of player

If we press **b**, the game will **go back** one step.

If we press **r**, the game will **restart** completely.

Please note that all characters you input must be **lowercase** (You **do not need** to press enter here). If you input any other characters, the terminal will prompt you to **input them again**.

Potential Issues you may encounter in game:

During the game, if you cannot find the character on the game board (FIGURE 3.8), the reason is that the character **overlaps** the target. This game keeps the target in the top.

Solution: You can look at the current character's position at the **top** of the board to find the character !

```
Current spot is 1 3
X X X X X X X X X X
X   O O       @     X
X                   X
X         X         X
X         X         X
X     X X X X X     X
X         X     @   X
X         X         X
X                   X
X                   X
X X X X X X X X X X
Now, you've used 8 steps
```

FIGURE 3.8 Player disappeared

3.4 After Game

If you push all the boxes to all the targets and the game is over, congratulations! ! !

The terminal will output the number of steps you used, and ask you if you want to play the game again. (FIGURE 3.9)

If you input **1**, the game will go back to the first step (ask rows and cols), if you **input anything else** then it will end the game. (You need to **press enter** here after inputting anything).

```
Current spot is 1 2
X X X X X X
X @ !     X
X         X
X         X
X         X
X X X X X X
Now, you've used 4 steps

Game Over, You use 4 steps
Do you want to play again?
Press 1 starts a new game
Press any other will end the game
```

FIGURE 3.9 Play again

3.5 Troubleshooting

All randomly generated game boards are solvable. If you encounter any troubles in the game that you cannot solve, then please follow the steps starting from the first page of the user guide. You could also contact us if you have any questions !

Chapter 4 : Game Strategy

4.1 Box against the outer wall

If a box against an outside wall (FIGURE 4.1), there must be a target against the same wall. That target next to the wall must be occupied by this box first; otherwise, the game will be unsolvable.

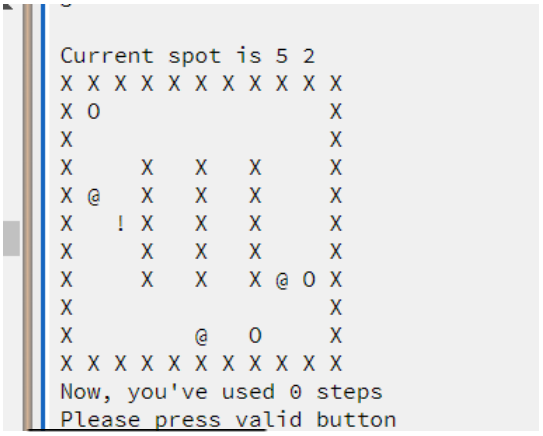

FIGURE 4.1 Box against outer wall

4.2 Two targets together

If the two targets are together (FIGURE 4.2), then we will push the closest box to the furthest target so we can more easily push the remaining box to the closer target.

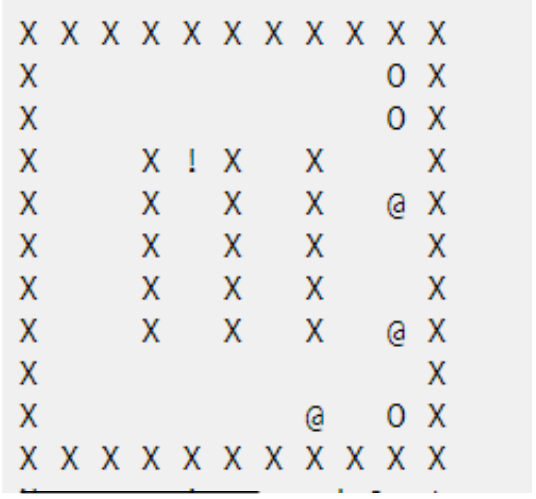

FIGURE 4.2 Two targets together

4.3 Box against the inner wall

If a box is next to an inner wall (FIGURE 4.3), the first priority is to move it out. We can move the character to another side of the box against the wall and push the box out. Then it will be easier to push the box onto the target !

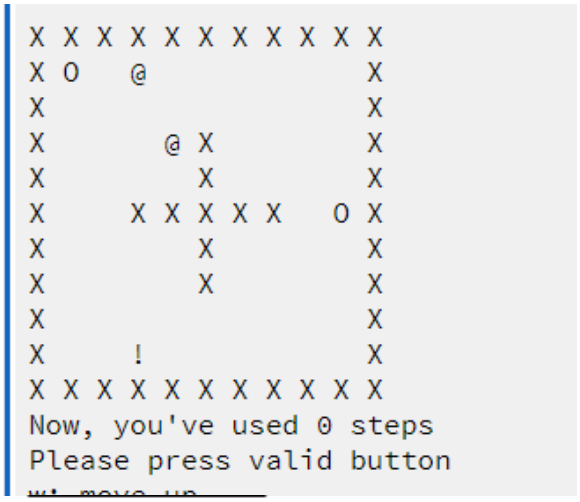

FIGURE 4.3 Box against inner wall

These are some basic strategies, but of course, you could use any strategy to win the game during the game play.

Finally, have fun ! ! !

(END)