# Sokoban with Lights

## An instruction manual

# Installation Guide

1. To open RIPES, click this link and follow the prompts if it has not been downloaded.
   ***RIPES*** *is a visual computer architecture simulator and assembly code editor.*

2. To open assembly code editor, navigate to the Editor tab on the left side.
   ***assembly*** *is a low-level programming language that is a human-readable representation of machine code instructions.*

3. To load the code:

   (a) Click `File -> Load Program`.

   (b) In the dialog box, choose "Source file" as the file type.

   (c) Click `Open...`, and select the source code (usually located in the Downloads folder), named `starter.s`.

   ***assembly*** *is a low-level programming language that is a human-readable representation of machine code instructions.*

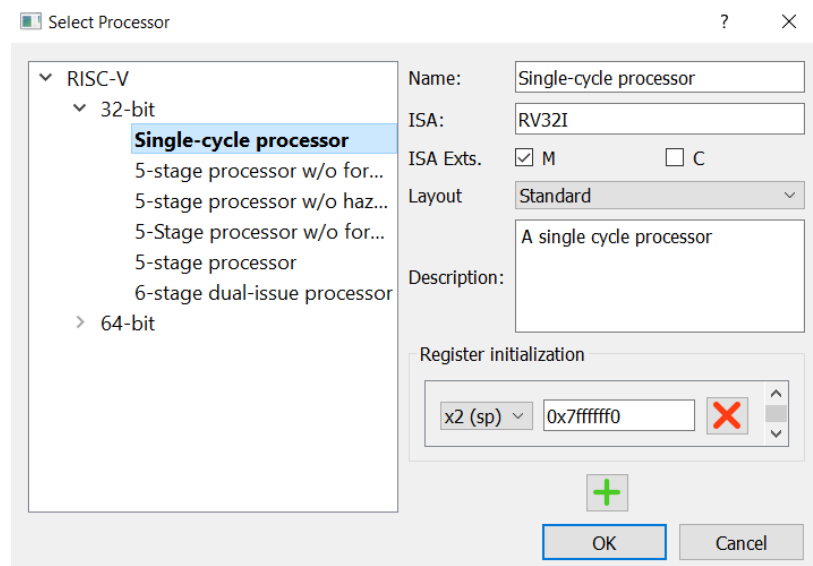4. To verify, confirm that the code is loaded in the middle text editor.

# Setup

## Processor Configuration:

1. To configure the processor, click on the "Processor" tab under "File" in the top left corner.



2. To select the Single-cycle Processor:

   - On the left side, under RISC-V → 32-bit, choose the Single-cycle processor. Click OK.



## I/O Setup:

1. To set up I/O, click on "I/O" on the left side.

2. In the left section under "Devices," select "LED Matrix."

## LED Matrix Configuration:

1. In the "LED Matrix 0" tab on the right:

   - Set the height to 8.
   - Set the width to 8.
   - Set the LED size to 50 or a size that ensures visibility.

   ***LED Matrix*** *a display of LEDs arranged in a grid.*
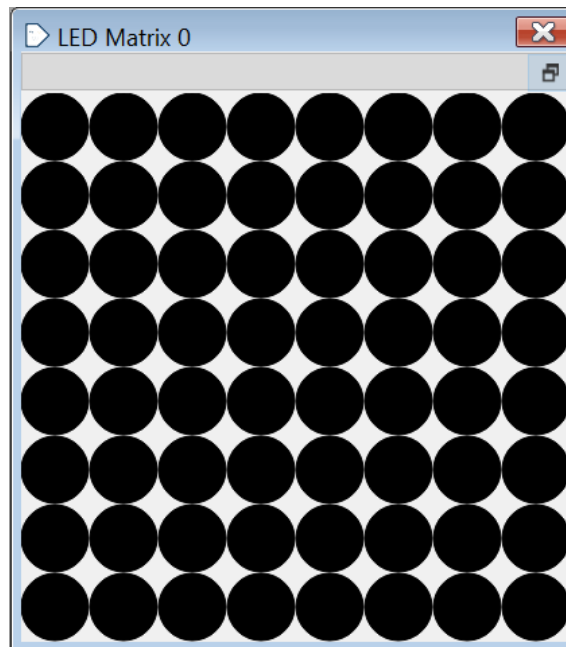
## D-pad Configuration:

1. To configure the D-pad, return to the "Devices" tab within the "I/O" section and select D-pad.
   ***D-pad*** *is a controller that allows the player to input directional commands.*

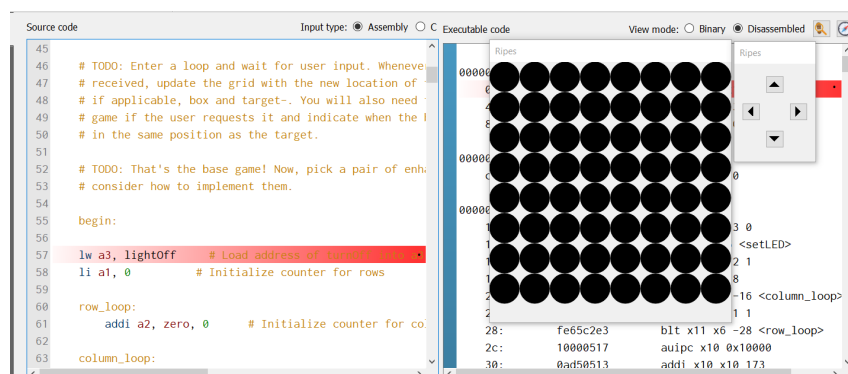2. A console pad appears; no need for configuration.

## Pop-out Devices:

1. To pop out both the D-pad and LED Matrix devices for better visibility, locate a button under the X button and click it.



## Return to Editor:

- To return to the Editor tab, navigate to the left side and select the Editor tab.
- Ensure that both the DPad and LED matrix appear as a floating window in the Editor tab.

# Game Instructions

**Run the Game:**

- On the second-to-top row, locate the options to run a program.

- To the right of the green button, set the runtime speed in the input dialog box to 10ms.

- On the same row, beside the image of a hammer, click the fast execution button to start the game.
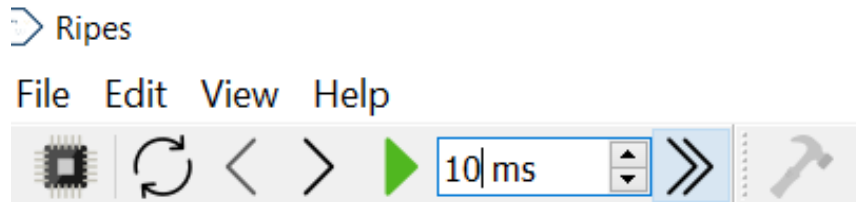


**Console Input for Game Difficulty:**

- Locate the box at the bottom of the screen labeled "Console."

- In this box, you will be prompted with "Game difficulty (1 - 6)."

- Input a number for difficulty in the console and click Enter.

- After clicking enter, you should see the LED Matrix turn on.

- **Note:** Difficulty corresponds to the number of boxes/targets in the game.

- **Note:** The game is restricted to be on an 8×8 matrix.
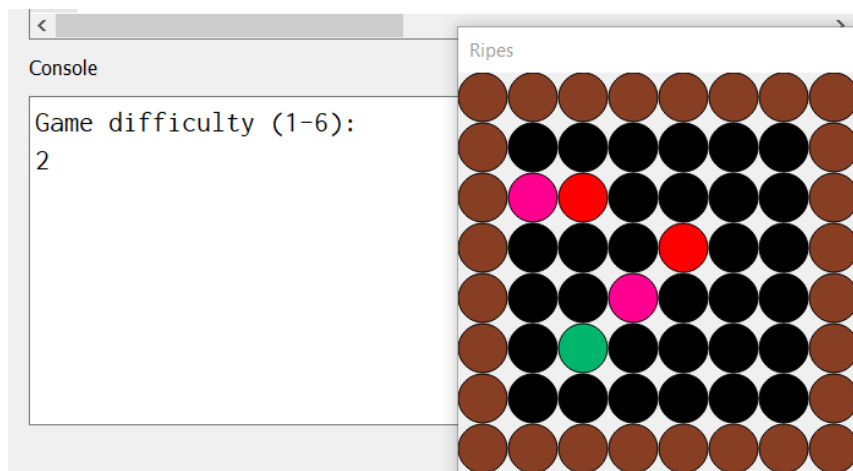


**Graphical Representation on LED Matrix:**

- Walls are represented in brown.

- The Player is represented in green.

- Targets are represented in pink.

- Boxes are represented in red.

## Gameplay (Sokoban Rules):

- **Player Movement:**

  - Player movement is restricted to the board so they may not go over the walls.
  - Player is limited to horizontal or vertical movements.
  - Player movement is controlled by the D-pad arrow keys. The player moves to the direction of the arrow key pressed if and only if the movement, as defined in the rules, is valid.

- **Box Manipulation:**

  - Boxes can be moved by the player walking up to them and pushing them to an adjacent square.
  - Player is limited to horizontal or vertical movements.
  - Player may not pull a box.

- **Constraints:**

  - Boxes cannot be pushed to squares occupied by walls or other boxes.
  - The player is allowed to step on the targets.

- **Victory Conditions:**

  - The number of boxes matches the number of targets.
  - The player wins when all boxes are successfully placed at their respective storage locations.

## Winning:

- After meeting the victory conditions defined above, the player will be unable to move their character.

- The game then asks if they want to restart via printing on the console.

- To restart, the player must **input 0, then press Enter to exit**; any other number before pressing Enter restarts the game.

## Restart Option:

- To restart at any point, push into the wall three consecutive times.

- This action halts the player's character movement.

- The console prompts the user to restart.

- Entering 0 and pressing Enter initiates the game to restart.

- Any other number input by the player then pressing Enter restores control and allows them to continue.

# Troubleshooting Guide

**If, at any point, following the instructions leads to an unexpected result, please:**
- Close RIPES.

- Open RIPES.

- Follow the steps from the beginning.