

Juosan Interactive Playground

User Manual



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

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1 Introduction

Thank you for using the Juosan Interactive Playground app! This manual will guide you through the app's features and usage to solve Juosan puzzles effectively.

2 About Juosan Puzzles

Juosan puzzles, created by Nikoli, provide an engaging pencil-and-paper challenge. They have been proven to be NP-complete, meaning their complexity increases as the puzzle size grows. Even computers find these puzzles difficult to solve. In a Juosan puzzle, you are presented with an $M \times N$ grid divided into multiple rectangular territories. The objective is to fill each cell with either a  or  symbol, following specific rules, namely:

- If a territory contains a number, the number of  or  symbols within it must be equal to that number;
- The  symbol cannot extend vertically for more than two cells;
- The  symbol cannot extend horizontally for more than two cells.

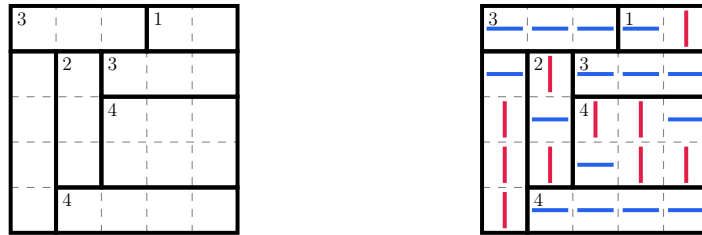


Figure 1: An example of a Juosan puzzle and its solution.

3 Application Overview

Our solver app utilizes a SAT-based approach to crack Juosan puzzles. The puzzle constraints are converted into Boolean formulas, which are then fed into a SAT solver. SAT solvers have been extensively optimized over the past 50 years and are widely used for solving Boolean formulas (which is also an NP-complete problem).

4 How to Use

In this application, some tools are provided to draw a custom puzzle of your own that later will be solved by our solver. This section describes each tool that is provided in the application.

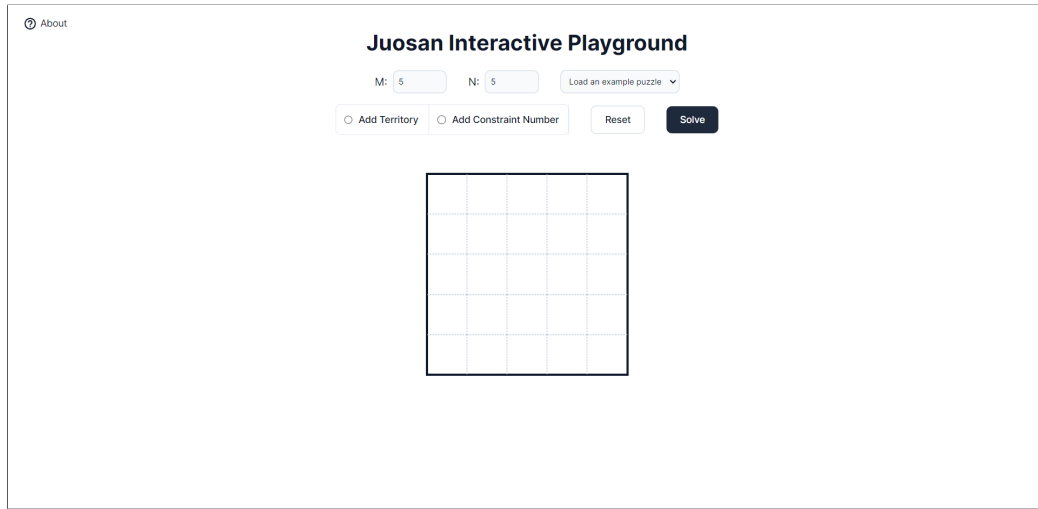


Figure 2: Application interface.

Adjusting the Puzzle Size: At the top of the app interface, you'll find the M and N fields. These allow you to adjust the size of the puzzle grid. Enter the desired values for M and N to set the size accordingly.

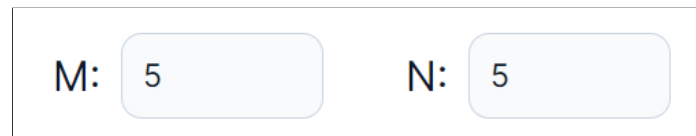


Figure 3: M and N fields.

Adding Territories: To add a territory, click on two opposite corners of the desired rectangular area within the grid. This action will mark the selected cells as a territory. Repeat this step to create additional territories as needed.

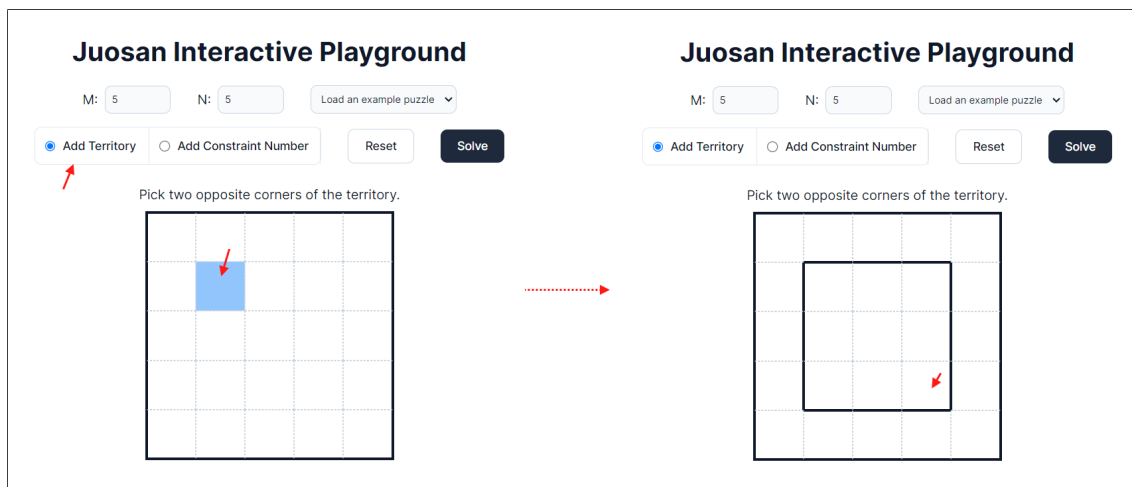




Figure 4: Using the “Add Territory” tool.

Adding Constraint Numbers to a Territory: Click on a territory within the grid to select it. Once selected, you can enter a number to add a constraint to the territory. This number indicates how many  or  symbols must be present within the territory.

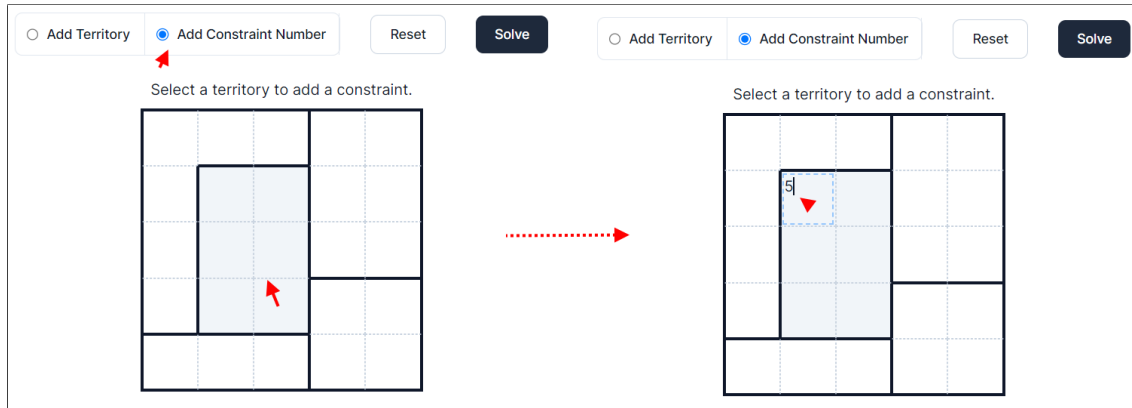


Figure 5: Using the “Add Constraint Number” tool.

Resetting the grid: If you want to start over or clear the grid, you can use the “Reset” button. Clicking on this button will clear the current puzzle and allow you to begin anew.



Figure 6: “Reset” button.

Solving the Puzzle: Once you have drawn the puzzle and added the necessary territories and constraints, you can click on the “Solve” button. Note that the drawn puzzle must consist of only rectangular territories for this to work. The app will initiate the solving process using the SAT solver algorithm. Sit back and let the app do its magic!

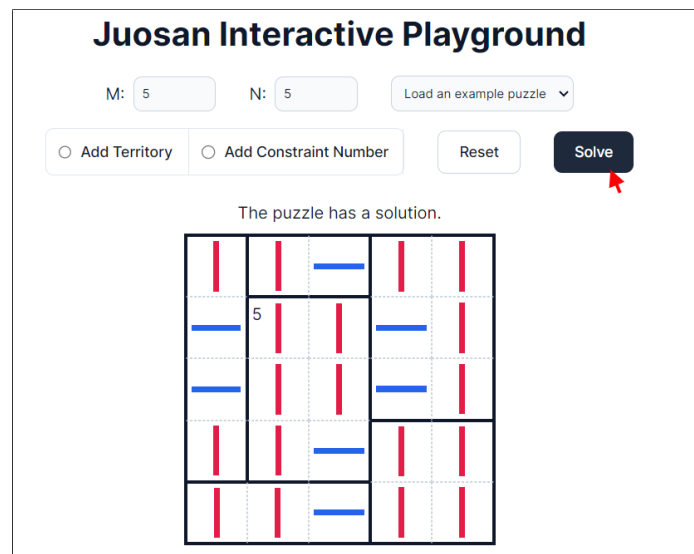


Figure 7: Pressing the “Solve” button.

Loading Example Puzzles: To provide you with some ready-to-solve puzzles, we have included a selection of example puzzles sourced from Janko. You can load these puzzles by selecting the desired example from the provided options. This feature allows you to practice solving different puzzle variations.

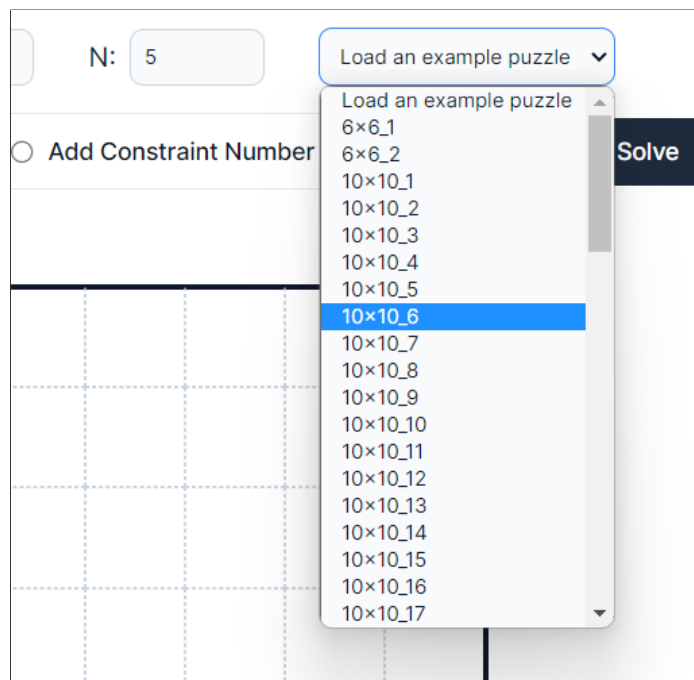


Figure 8: Available example puzzles.

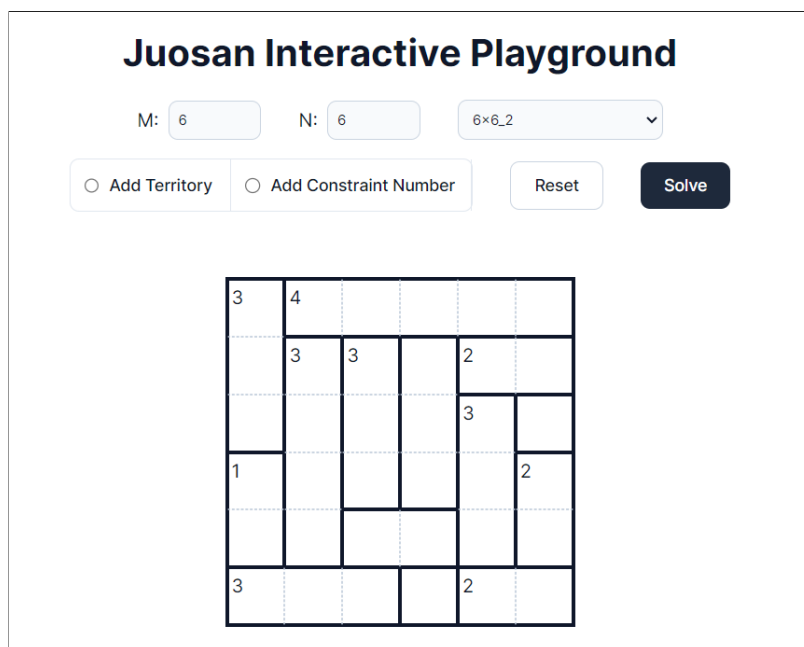


Figure 9: After loading one of the example puzzles.

It is worth noting that this manual is also summarized in the “About” button located at the top left corner of our interface. In case you forget something, you can simply refer to it there for a quick recap. Enjoy using the Juosan Interactive Playground app, and have fun cracking those challenging puzzles!

5 Important Links

Below are some important links related to this solver app:

1. **The source code for this app:** <https://github.com/tsaqifammar/juosan-playground-app>.
2. **More about Juosan puzzles:** <https://www.janko.at/Raetsel/Juosan/index.htm>,
<https://www.nikoli.co.jp/en/puzzles/juosan/>.