

# Solver of Tricky Triple Puzzles Based on Constraint Programming

Ângelo Daniel Pereira Mendes Moura<sup>[upXXXXXXXXXX@fe.up.pt]</sup>  
and Clara Alves Martins<sup>[up201806528@fe.up.pt]</sup>

Faculty of Engineering of the University of Porto  
<https://www.fe.up.pt>

**Abstract.** The goal of this project was the construction of a program based in constraints programming that would solve problems of combinatorial decision. The problems studied in this paper are called Tricky Triple. These are a type of grid puzzle where each group of 3 adjacent cells must hold exactly 2 of 3 possible symbols. In this paper we will explain in depth the structure of these puzzles, how our solver has implementation using SICStus Prolog and the performance results we obtained.

**Keywords:** tricky-triple · prolog · clpfd · constraint-programming.

## Table of Contents

Solver of Tricky Triple Puzzles Based on Constraint Programming . . . . .	1
<i>Ângelo Daniel Pereira Mendes Moura and Clara Alves Martins</i>	
1 Introduction . . . . .	3
2 Problem Description . . . . .	3
3 Approach . . . . .	3
3.1 Decision Variables . . . . .	3
3.2 Constraints . . . . .	3
4 Solution Presentation . . . . .	3
5 Experiments and Results . . . . .	3
5.1 Dimensional Analysis . . . . .	3
5.2 Search Strategies . . . . .	3
6 Conclusions and Future Work . . . . .	3
7 Section Sample . . . . .	3
7.1 A Subsection Sample . . . . .	3

## 1 Introduction

## 2 Problem Description

The Tricky Triple puzzles are a type of grid puzzle. The goal of the puzzle is to fill each of the grid's white cells with one of 3 symbols. The only rule is that each group of 3 adjacent white cells (horizontally, vertically, or diagonally) must contain exactly 2 of one of the symbols.

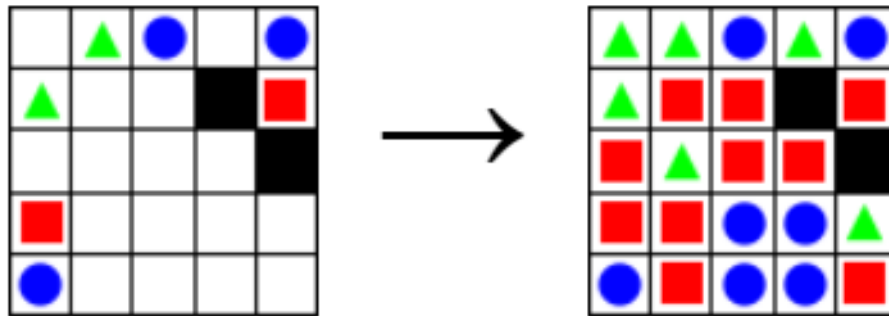


Fig. 1. Example of Tricky Triple Puzzles, before and after solving it.

## 3 Approach

### 3.1 Decision Variables

### 3.2 Constraints

## 4 Solution Presentation

## 5 Experiments and Results

### 5.1 Dimensional Analysis

### 5.2 Search Strategies

## 6 Conclusions and Future Work

## 7 Section Sample

### 7.1 A Subsection Sample

Please note that the first paragraph of a section or subsection is not indented. The first paragraph that follows a table, figure, equation etc. does not need an indent, either.

Subsequent paragraphs, however, are indented.

**Sample Heading (Third Level)** Only two levels of headings should be numbered. Lower level headings remain unnumbered; they are formatted as run-in headings.

*Sample Heading (Fourth Level)* The contribution should contain no more than four levels of headings. Table 1 gives a summary of all heading levels.

**Table 1.** Table captions should be placed above the tables.

Heading level	Example	Font size and style
Title (centered)	<b>Lecture Notes</b>	14 point, bold
1st-level heading	<b>1 Introduction</b>	12 point, bold
2nd-level heading	<b>2.1 Printing Area</b>	10 point, bold
3rd-level heading	<b>Run-in Heading in Bold.</b> Text follows	10 point, bold
4th-level heading	<i>Lowest Level Heading.</i> Text follows	10 point, italic

Displayed equations are centered and set on a separate line.

$$x + y = z \tag{1}$$

Please try to avoid rasterized images for line-art diagrams and schemas. Whenever possible, use vector graphics instead (see Fig. 2).



**Fig. 2.** A figure caption is always placed below the illustration. Please note that short captions are centered, while long ones are justified by the macro package automatically.

**Theorem 1.** *This is a sample theorem. The run-in heading is set in bold, while the following text appears in italics. Definitions, lemmas, propositions, and corollaries are styled the same way.*

*Proof.* Proofs, examples, and remarks have the initial word in italics, while the following text appears in normal font.

For citations of references, we prefer the use of square brackets and consecutive numbers. Citations using labels or the author/year convention are also acceptable. The following bibliography provides a sample reference list with entries for journal

## References

1. Author, F.: Article title. *Journal* **2**(5), 99–110 (2016)
2. Author, F., Author, S.: Title of a proceedings paper. In: Editor, F., Editor, S. (eds.) *CONFERENCE 2016, LNCS*, vol. 9999, pp. 1–13. Springer, Heidelberg (2016). <https://doi.org/10.1007/1234567890>
3. Author, F., Author, S., Author, T.: Book title. 2nd edn. Publisher, Location (1999)
4. Author, A.-B.: Contribution title. In: *9th International Proceedings on Proceedings*, pp. 1–2. Publisher, Location (2010)
5. LNCS Homepage, <http://www.springer.com/lncs>. Last accessed 4 Oct 2017