Solver of Tricky Triple Puzzles Based on Constraint Programming

upXXXXXXXXX@fe.up.pt Ângelo Daniel Pereira Mendes Moura
up201806528@fe.up.pt Clara Alves Martins

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

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Abstract. In this article, we show how to use constraint programming to solve Tricky Triple Puzzles. We present a consistent method to analyze these puzzles and to obtain a solution to them.

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

1 Introduction

This project consists of building a program, in Logic Programming with Restrictions, for solving a combinatorial decision. The problems studied are Tricky Triple Puzzles, which are grid puzzles. To do so, we will analyze these problems and proceed to implement our solver using SICStus Prolog. Afterward, we will be discussing the performance results obtained.

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, a square, a circle, or a triangle. 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. So, each group of 3 white cells will have 2 of 3 symbols. Each puzzle below has a unique solution.

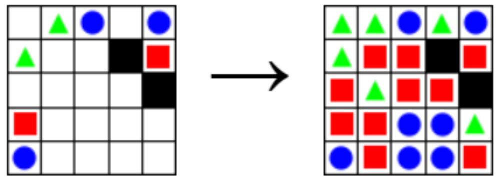

Fig. 1. Example of Tricky Triple Puzzles, before and after solving it.

3 Approach

Throughout the development of this project, we used a Constraint Logic Programming approach. Our board is a list of lists, where each element is a number indicating the symbol placed on that cell. Each one of these numbers represents a different symbol. The number 0 represents a black cell, which cannot be generated by the solver. The number 1 represents a green triangle, while the number 2 represents a red square and the number 3 a blue circle.

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.

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

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

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

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

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