Contribution Title

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Abstract. The abstract should briefly summarize the contents of the paper in 150–250 words.

Keywords: First keyword · Second keyword · Another keyword.

1 Introduction

In manufacturing industry, finding the correct positioning of the parts fasteners during the milling and cutting processes, in order to reduce vibrations and keep the element as firm as possible, is a fundamental problem to be solved to ensure a certain quality of the finished product [3].

Several studies have been carried out on the forms and materials that can be used to minimize oscillations and vibrations [5, 1], among these one of the most adopted strategies in the manufacturing field involves the use of adsorption methods based on the adoption of vacuum suction cups [6, 2].

In this study, we will use as a reference a machine capable of performing operations on a wooden panel, such as milling, contouring, and drilling, supported by a system of movable bars on which suction cups can be vertically adjusted for secure holding.

Several factors must be taken into account for effective positioning of suction cups, including the type of machining operation, the specific areas of the workpiece that will be affected, and the geometry of the part [4]. In particular, when dealing with cutting operations, it is essential to avoid placing fixtures beneath areas where through-cuts will occur to prevent potential damage to the fasteners.

It is also important to consider that the available resources are limited. Typically, the machine has a fixed capacity, allowing for only a certain number of bars and a finite number of various types of fixings. Within these constraints, we must decide how to allocate the resources efficiently, ensuring that we do not exceed the available quantity while providing adequate support for the workpiece. The objective, however, is not to maximize the use of resources but to strategically cover the most critical areas of the workpiece to achieve optimal support.

To address this problem, we employed Constraint Programming (CP) and compared the results with those generated by the current system. The comparison revealed that the solution obtained via CP was easier to implement, reducing the risk of human error. In the current system, the machine operator must manually specify the number of suction cups to be used, which increases the likelihood of errors, especially when too few are selected.

Moreover, the CP-based solution demonstrated an improvement in the support of the workpiece. Specifically, the solution ensures that if components are cut from the original piece, each sub-part large enough to accommodate suction cups is adequately supported, thereby preventing its unintended detachment. This is achieved by ensuring that the center of gravity of each sub-part remains within the perimeter formed by the fixtures inside it. In contrast, examples show that some solutions generated by the current system fail to meet this requirement, whereas the CP solution consistently satisfies this condition.

The remainder of this article is organized as follows. Section 2 presents an overview of similar problems that have been addressed using Constraint Programming. In Section 3, we explain the method used to identify the optimal points for support placement and how these points are represented. Section 4 details the constraint model developed to determine the positioning of the elements. Finally, Section 5 presents the results of our approach, comparing them with those of the previous system.

2 First Section

2.1 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)	**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

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. 1).

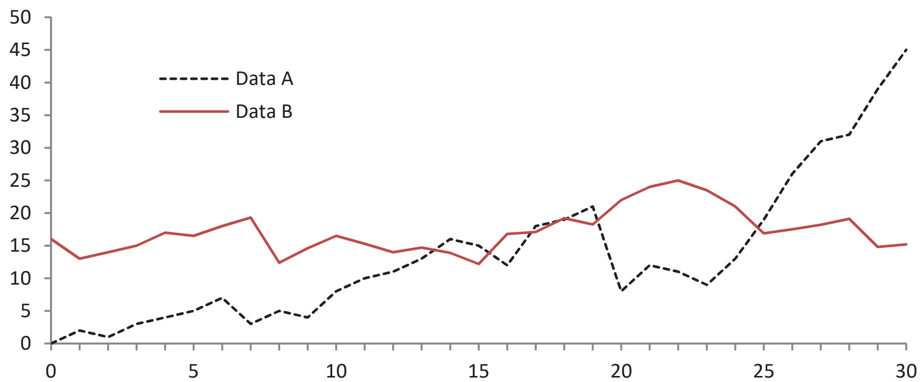

Fig. 1. A figure caption is always placed below the illustration. Please note that short captions are centered, while long ones are justified by the macro package automatically.

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 articles [**?**], an LNCS chapter [**?**], a book [**?**], proceedings without editors [**?**], and a homepage [**?**]. Multiple citations are grouped [**?**,**?**,**?**], [**?**,**?**,**?**,**?**].

Acknowledgments. A bold run-in heading in small font size at the end of the paper is used for general acknowledgments, for example: This study was funded by X (grant number Y).

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that are relevant to the content of this article. Or: Author A has received research grants from Company W. Author B has received a speaker honorarium from Company X and owns stock in Company Y. Author C is a member of committee Z.

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