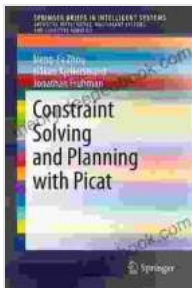# Constraint Solving and Planning with Picat: SpringerBriefs in Intelligent Systems

Constraint solving is a powerful technique for solving problems that involve finding a set of values that satisfy a set of constraints. Planning is a related technique that is used to find a sequence of actions that achieve a desired goal. Both constraint solving and planning can be used to solve a wide variety of problems, including scheduling, resource allocation, and logistics.

Constraint Solving and Planning with Picat (SpringerBriefs in Intelligent Systems Book 0)

by Bertrand Puard

★★★★★ 5 out of 5

Language	: English
Text-to-Speech	: Enabled
Enhanced typesetting	: Enabled
Paperback	: 37 pages
Item Weight	: 3.84 ounces
Dimensions	: 6 x 0.09 x 9 inches
File size	: 5997 KB
Screen Reader	: Supported
Print length	: 250 pages

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Picat is a free and open-source constraint programming language that is well-suited for solving constraint satisfaction and planning problems. Picat is based on a Prolog-like syntax, which makes it easy to learn and use. Picat also has a powerful constraint solver that can handle a wide variety of constraints.

This book offers a concise and practical guide to solving constraint satisfaction and planning problems with Picat. The authors introduce the main concepts and techniques of constraint solving and planning, provide a detailed overview of Picat, and present a set of case studies that demonstrate how to use Picat to solve real-world problems. The book is suitable for students, researchers, and practitioners interested in using constraint programming for solving complex problems.

Main Concepts and Techniques

The main concepts and techniques of constraint solving are:

1. **Variables**: Variables represent the unknown values that need to be found.

2. **Domains**: Domains define the set of possible values that a variable can take.

3. **Constraints**: Constraints are conditions that must be satisfied by the values of the variables.

4. **Search**: Search is the process of finding a set of values for the variables that satisfies all of the constraints.

The main concepts and techniques of planning are:

1. **States**: States represent the world at a particular point in time.

2. **Actions**: Actions are operations that can be performed to change the state of the world.

3. **Plans**: Plans are sequences of actions that achieve a desired goal.

4. **Planning**: Planning is the process of finding a plan that achieves a desired goal.

Picat Overview

Picat is a free and open-source constraint programming language that is well-suited for solving constraint satisfaction and planning problems. Picat is based on a Prolog-like syntax, which makes it easy to learn and use. Picat also has a powerful constraint solver that can handle a wide variety of constraints.

Picat programs consist of a set of rules. Each rule has a head and a body. The head of a rule specifies the goal that the rule achieves. The body of a rule specifies the conditions that must be satisfied in order for the rule to be applied.

The following is an example of a Picat rule that solves a simple constraint satisfaction problem:

picat solve([X, Y]) :- X #>= 0, X #== 0, Y #=This rule defines a constraint satisfaction problem with two variables, X and Y. The constraints are that X and Y must be greater than or equal to 0, X and Y must be less than or equal to 10, and X plus Y must equal 10. The rule uses the #>=, #=

To solve a constraint satisfaction problem with Picat, you need to define a set of rules that specify the constraints. You can then use the Picat solver to find a solution to the problem.

Case Studies

This book presents a set of case studies that demonstrate how to use Picat to solve real-world problems. The case studies include:

1. **Scheduling**: Scheduling problems involve finding a set of times to perform a set of tasks. Picat can be used to solve scheduling problems by defining a set of constraints that specify the relationships between the tasks.

2. **Resource allocation**: Resource allocation problems involve finding a way to allocate a set of resources to a set of tasks. Picat can be used to solve resource allocation problems by defining a set of constraints that specify the availability of the resources and the requirements of the tasks.

3. **Logistics**: Logistics problems involve finding a way to transport a set of goods from a set of origins to a set of destinations. Picat can be used to solve logistics problems by defining a set of constraints that specify the capacities of the vehicles and the distances between the origins and destinations.

The case studies in this book demonstrate the power and flexibility of Picat for solving constraint satisfaction and planning problems. Picat is a valuable tool for anyone who needs to solve complex problems.

This book provides a concise and practical guide to solving constraint satisfaction and planning problems with Picat. The authors introduce the main concepts and techniques of constraint solving and planning, provide a detailed overview of Picat, and present a set of case studies that demonstrate how to use Picat to solve real-world problems. The book is

suitable for students, researchers, and practitioners interested in using constraint programming for solving complex problems.

Alt attribute for image: "A screenshot of the Picat IDE, showing the code for the example constraint satisfaction problem."
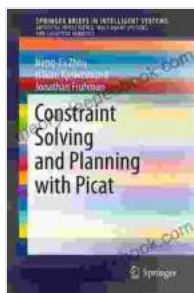
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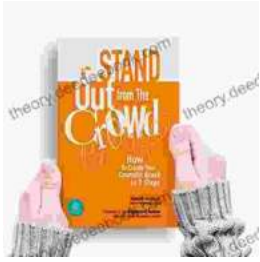
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