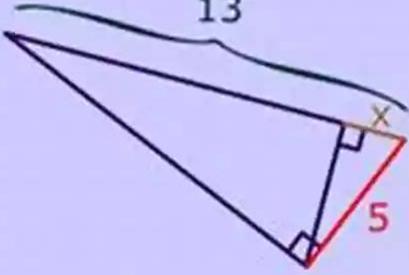
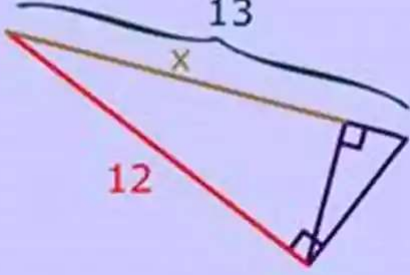
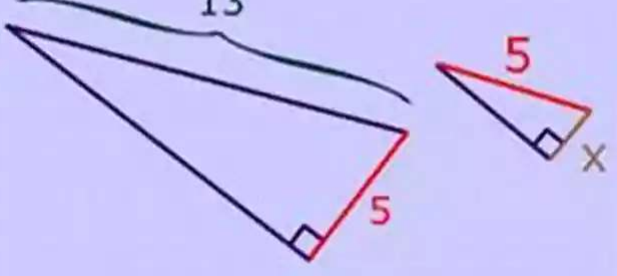
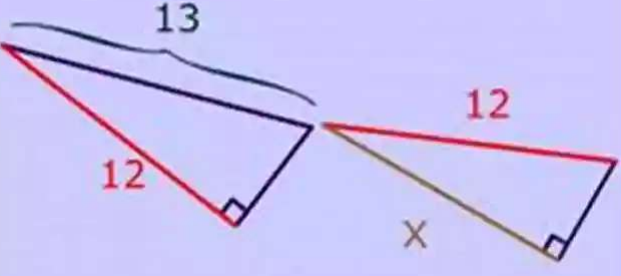


Solving Problems Of Computational Geometry By Means Of Geometric Constructions

$$\frac{\text{Hyp}}{\text{Leg}} = \frac{\text{Leg}}{\text{Side}}$$

 $\frac{13}{5} = \frac{5}{x}$	 $\frac{13}{12} = \frac{12}{x}$
	

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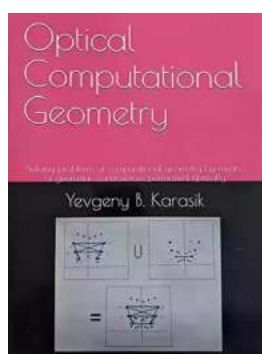
The Power of Geometric Constructions in Computational Geometry

Computational geometry is a branch of computer science that deals with solving problems related to geometric objects and their properties. It encompasses various algorithms and techniques to manipulate geometrical data to find

solutions to complex problems. One approach that has proven to be powerful in solving such problems is the use of geometric constructions.

What are Geometric Constructions?

In the realm of computational geometry, geometric constructions involve creating new geometric objects or transformations using only a set of basic tools. These tools typically include a compass and a straightedge, with which one can perform operations like drawing lines, circles, and locating intersections.



Optical Computational Geometry: Solving problems of computational geometry by means of geometric constructions performed optically

by Yevgeny B. Karasik([Print Replica] Kindle Edition)

★★★★★ 5 out of 5

Language : English

File size : 2712 KB

Print length: 153 pages

Lending : Enabled



Geometric constructions have a long history dating back to ancient times when mathematicians used them to solve various problems. Today, they continue to be a valuable tool in computational geometry as they provide a visual and intuitive approach to solving complex geometric problems.

Solving Problems with Geometric Constructions

One advantage of using geometric constructions in computational geometry is their ability to simplify complex problems by breaking them down into smaller, more manageable parts. By using a series of construction steps, these problems

can be approached systematically, enabling the identification of key relationships and properties.

Geometric constructions also allow for the visualization of abstract concepts and relationships, which can lead to novel insights and solutions. By constructing geometric objects and exploring their properties, patterns can be observed, and conjectures can be made. These conjectures can then be rigorously proven using mathematical reasoning or used as a basis for further exploration.

Application of Geometric Constructions in Computational Geometry

Geometric constructions find wide application in various areas of computational geometry, including:

- **Convex Hull:** Geometric constructions can be used to find the convex hull of a set of points. By constructing an enclosing polygon that contains all the points, the convex hull can be easily determined.
- **Voronoi Diagrams:** Geometric constructions play a significant role in constructing Voronoi diagrams, which partition space based on the proximity to a set of points.
- **Triangulation:** Geometric constructions are crucial in constructing triangulations of polygons or point sets, which are used in various applications, such as mesh generation and network optimization.
- **Intersection Detection:** Geometric constructions provide an efficient method for detecting intersections between geometric objects, such as lines and circles.
- **Visibility Determination:** Geometric constructions can be employed to determine the visibility of an object from a given point, which has applications in robotics and computer graphics.

Examples of Problem Solving with Geometric Constructions

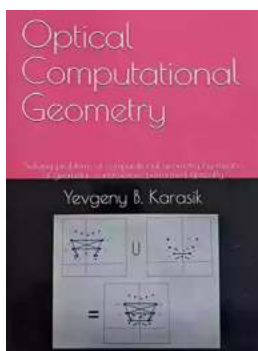
To illustrate the power of geometric constructions in computational geometry, let's consider a well-known problem: Finding the intersection between two lines.

Given two lines defined by their equations, we can use geometric constructions to find their point of intersection. By constructing perpendicular lines from the given lines to create a parallelogram, the intersection point can be easily located.

Another example is finding the centroid of a triangle. By constructing medians from each vertex of the triangle to the opposite side, the point of intersection of these medians is the centroid.

Geometric constructions have proven to be a valuable tool for solving problems in computational geometry. Their ability to simplify complex problems, visualize abstract concepts, and enable systematic problem-solving makes them an indispensable asset for researchers and practitioners in the field.

As technology and computational power continue to advance, geometric constructions, in combination with algorithms and data structures, will continue to play a vital role in solving increasingly complex computational geometric problems.



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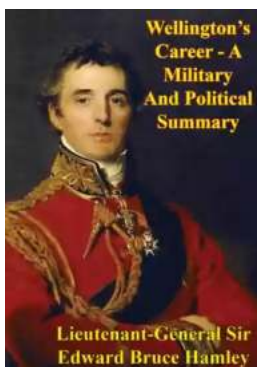
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Geometric problems can be solved in two ways, by calculating the solution or by its construction. The classical means of geometric constructions, the straight edge/ruler and the compass, are very limited in their capabilities. Most geometric problems cannot be solved by constructing the solution with their help. That is why until recently they were solved numerically with the help of algorithms of Computational Geometry. However advances in optical technology allowed solving them by step-by-step formation of an optical image of the solution. Such image formation is nothing else but its step-by-step construction by optical means. Just not a ruler and a compass are used to draw a solution on a sheet of paper, but optical devices are used to step-by-step transform the images of the given figures (represented as optical transparencies) into an image of the solution to a problem. This book is an to the theory of such geometric constructions with the help of optical devices. It presents step-by-step procedures for transforming the light wave images of the given figures into images of solutions to various geometric problems. Such procedures are dubbed optical algorithms in the book. The book is thereby the first presentation of the theory of optical algorithms.



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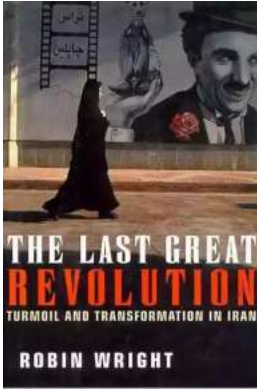
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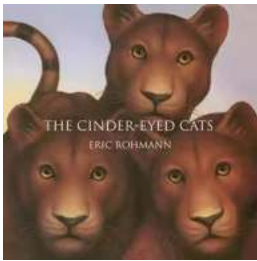
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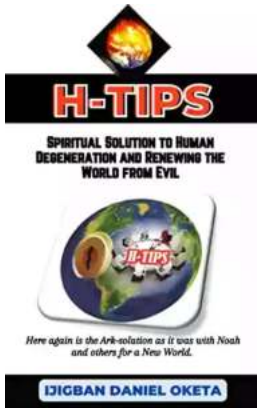
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