

ConstructiveSolidGeometry.jl

A constructive solid geometry and ray tracing package for scientific simulation

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Outline

- Intro to constructive solid geometry (CSG)
- Intro to ray tracing
- Motivation for package
- Functionality
- Interesting implementation details
- Demo

What is Constructive Solid Geometry (CSG)?

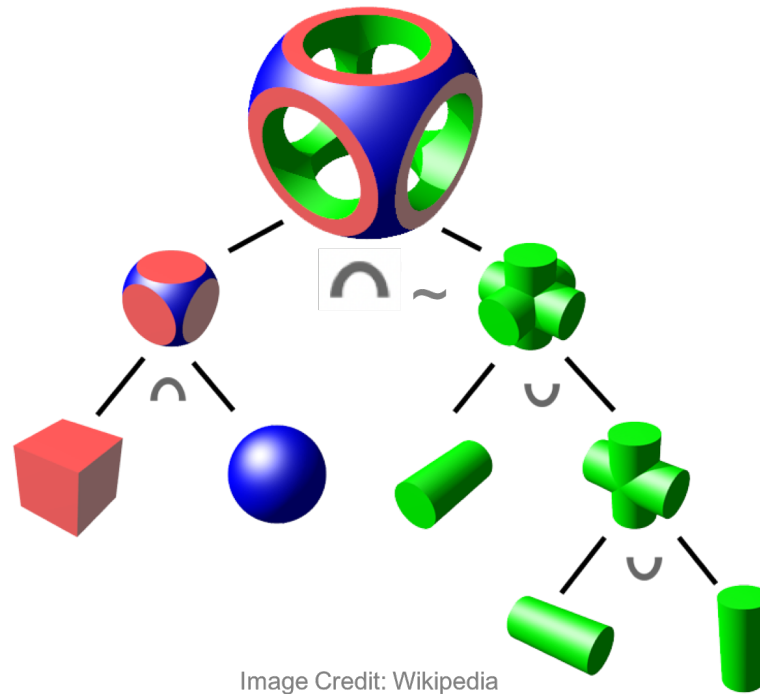
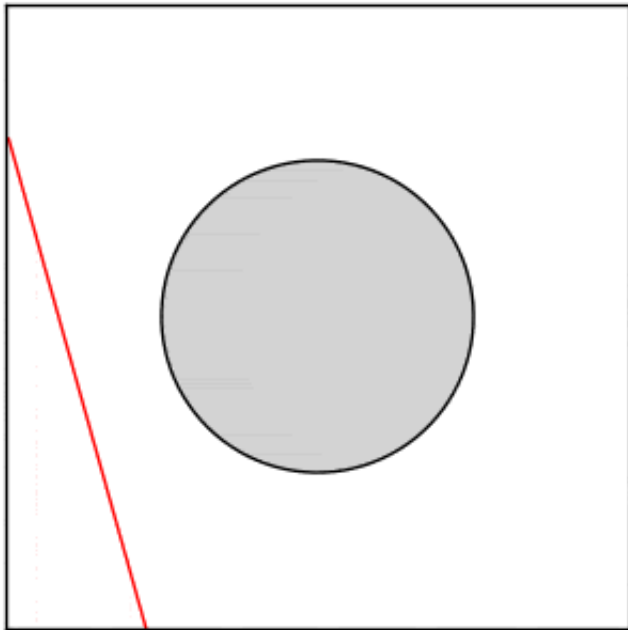


Image Credit: Wikipedia

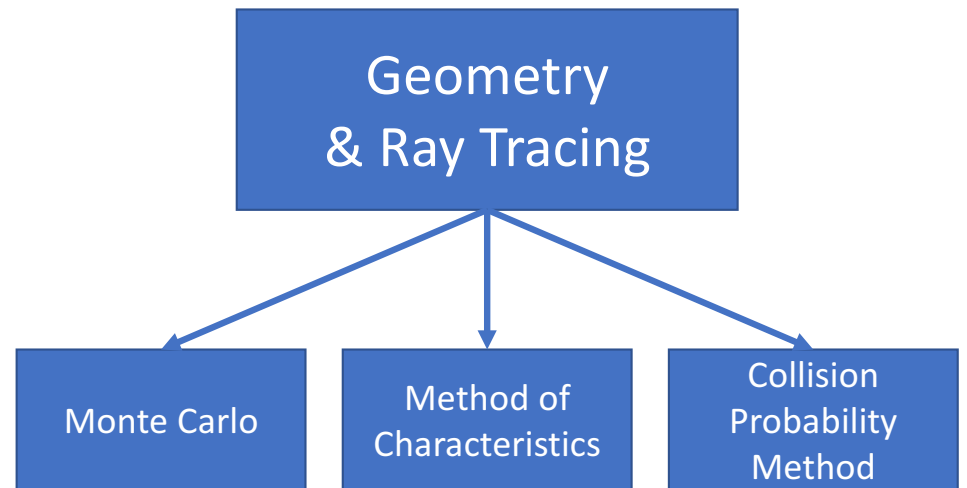
What is Ray Tracing?



- Ray
 - Origin
 - Direction
- Ray tracing determines:
 - Which region a point is in
 - Closest intersection

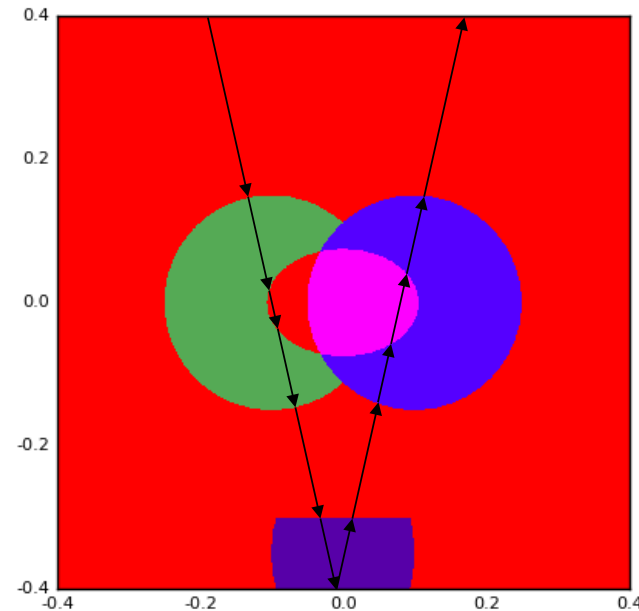
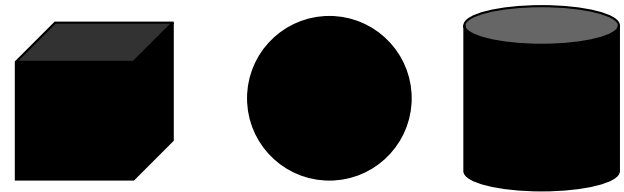
Motivation for Package

- Needed by some simulation methods
 - Particularly reactor physics
- Needed by students in course 22 (Nuclear Engineering)
- No existing CSG/ray tracing packages in Julia

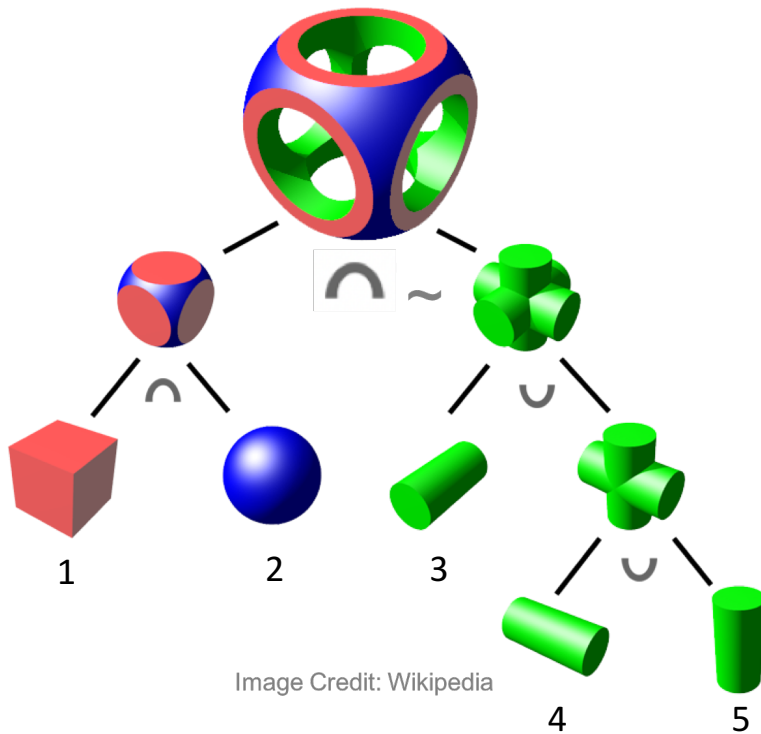


ConstructiveSolidGeometry.jl Functionality

- Create primitive 2D/3D shapes
- Logically assemble shapes
- Plot slices
- Performs ray tracing
- Well documented with annotated examples
- Enables easy development of physics applications



Implementation Detail of Note: Expressions



- Logical construction of regions is a tree
- $(1 \cap 2) \cap \sim (3 \cup (4 \cup 5))$
- Julia Expressions make this easy
- Recursive function to navigate Julia Expression tree

Quick Demo