Geometric Constraint Solving

Part 4
Solution Space
Which Instance to Select?

Problem arises because
1. Nonlinearity implies multiple solutions
2. Design intent incompletely expressed

Situation
- No compelling solution to-date
- General approaches perform poorly
- Simple heuristics often do well
General Approach Example

“Closed contours should not self-intersect”
- Solution is NP-hard to find – adverse impact on scalability
- Infinite and complex solutions should be excluded – mathematical theory missing

Heuristics Example

“Preserve relative position of geometries”
- Input sketch defines relative position
- Simple, effective, but fails on occasion
More Heuristics

Issues:
Line orientation, circle orientation

Heuristics Succeed
Heuristics Fail

User-Directed Selection

- Visual manipulation good for single elements
- Complex situations handled by using a tree that selects at each level
- Works, but is not always intuitive
Summary, Part 5

- Basic 2D algebraic solver requires only 5 subroutines
- Triangle decomposition covers a sizeable domain in 2D
- Simple solver heuristic satisfy many application instances but can fail too