Orthogonal Drawings of Graphs and Their Relatives
Part 0 - Introduction

Walter Didimo
University of Perugia
walter.didimo@unipg.it
What this seminar is

• An introduction to orthogonal graph drawing
  – focus on specific problems and classical techniques
  – practical considerations
  – some recent results
  – extensions to related topics
  – some open problems
What this seminar is NOT

• A comprehensive survey on orthogonal graph drawing
  – some results are only mentioned
  – some proofs/techniques are only sketched
Prerequisites

• Basic concepts of graph theory and planarity
  – graph connectivity
  – planar graphs and planar embeddings
Orthogonal drawings: Definition

crossings = 1  
bends = 12  
max. bends per edge = 3  
area = 30
Orthogonal drawings: Motivation

- database design
- circuit design
- software design
Quality metrics (aesthetics)

- Metrics used to evaluate the "quality" (readability) of a drawing
Quality metrics (aesthetics)

Crossings
Quality metrics (aesthetics)

Crossings

Bends
Quality metrics (aesthetics)

Crossings

Bends

Area
Orthogonal drawings: Comparison
Orthogonal drawings: Bends

planar graph

planar orthogonal drawings

bends = 8
max. bends per edge = 2

bends = 7
max. bends per edge = 3
Orthogonal drawings: Bends

bends = 9
max. bends per edge = 2

bends = 7
max. bends per edge = 3
Orthogonal drawings: Bends

bends = 18
max. bends per edge = 2

bends = 10
max. bends per edge = 3
Orthogonal drawings: Approaches

• Efficient heuristics for bend minimization
  – ...

• Exact approach for bend minimization of *plane* graphs
Orthogonal drawings: Approaches

• A seminal experimental work shows that minimizing the total number of bends has a strong impact on several quality metrics

• More in general, the approach called topology-shape-metrics with bend-minimization appears to be superior
An old (impressive) picture
Orthogonal drawings: Plane vs planar

bend-min for fixed planar embedding

bend-min for variable planar embedding
Summary

• Part 1
  – Topology-shape-metrics approach: theory and practice

• Part 2
  – Orthogonal drawings in the variable embedding setting

• Part 3
  – Relatives of orthogonal drawings: Right-angle-crossing drawings