CS 559: Computer Vision

Lecture 1

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Outline

- Gestalt laws for grouping
Perceptual Grouping -- Gestalt Laws

Gestalt laws are summaries of image properties imposed by the constraints of real world

- Similarity
- Proximity
- Closure
- Good continuation
- Common fate
- Figure-ground
- Symmetry
- Periodicity
Gestalt Laws -- Similarity

- We tend to group objects with similar properties (color, shape, texture)
- Because objects of the same kind are made of the same matter, and same matter often yields same image properties

Source: N. Ahuja
Gestalt Laws -- Proximity

- We tend to group nearby objects
- Because matter is cohesive resulting in meaningful configurations of nearby objects

Source: N. Ahuja
Gestalt Laws -- Closure

- We tend to ignore gaps and hallucinate complete, closed contours.
- Because objects occupy finite 3D volumes, and thus have closed surfaces, and so their image projections occupy regions with closed boundaries.

Source: N. Ahuja
Gestalt Laws -- Good Continuation

• We prefer to see configurations forming smooth contours

• Because objects have locally smooth surfaces, and a smooth surface projects in image as a smooth boundary contour

Source: N. Ahuja
Gestalt Laws -- Common Fate

• We tend to see distinct objects with same motion as a unit

• Because a moving object may consist of parts whose motions depend on the object’s motion, and thus project in image coherently

Source: N. Ahuja
Gestalt Laws -- Figure-Ground

- We tend to see certain image areas as foreground or figure and the remaining areas as background or ground.
- Because our knowledge is in terms of distinct objects.

Source: N. Ahuja
Gestalt Laws -- Symmetry

- We tend to see symmetric objects as figure against asymmetric background.

- Because many man-made and natural objects are symmetric due to functionality/growth/reproduction processes, and image formation usually preserves symmetry.

Source: N. Ahuja
Gestalt Laws -- Periodicity

- We prefer to see objects that periodically repeat.
- Because many man-made and natural objects are spatially periodic due to functionality/growth/reproduction processes, and image formation usually preserves periodicity.

Source: N. Ahuja
Gestalt Laws -- Periodicity

- We prefer to see objects that periodically repeat
- Because many man-made and natural objects are spatially periodic due to functionality/growth/reproduction processes, and image formation usually preserves periodicity

Source: N. Ahuja
Which Gestalt Laws Do We Use Here?

What Gestalt law should we apply first?

Different orderings of the Gestalt laws $\Rightarrow$ Different groupings
From Low-Level Immediately to High-Level Reasoning

T-junctions $\Rightarrow$ Occlusion
From Low-Level Immediately to High-Level Reasoning

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T-junctions $\Rightarrow$ Occlusion
Top-down Interpretation from Context

- Context and feedback from higher levels resolve low-level ambiguities
- Because of the context we may not be even aware of alternatives

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