Object Identification and Recognition (I)

Introduction to Computational and Biological Vision

CS 202-1-5261

Computer Science Department, BGU

Ohad Ben-Shahar

Object identification and recognition

What does it mean to "recognize and object"?

- **Retrieving information associated with an object that is not provided in the raw data (the image) itself**
  - **Name**
  - **Type**
  - **Class**
  - **Function**
  - **What would it do to me if it caught me**
  - ⋮
- **Matching against a knowledge base (memory)**

Object identification and recognition

Recognition as classification

- **Hierarchical**
  - **My car**
  - **Jeep**
  - **Car**
  - **Vehicle**
  - **Man-made object**
  - ⋮

- **Classification level depends on application or circumstances.**

Object identification and recognition

How are objects recognized?

- **Characteristic shape or structure**
- **Relative location**
- **Characteristic motion**
- **Color**
- **Texture**
  - ⋮

Object identification and recognition

Issues in shape perception

- **What is the "shape" of an object?**

  That spatial property of objects that don't change when certain spatial transformations are applied.

- **Shape constancy**

  When does the same object have the same shape despite differences in viewing conditions

- **Shape equivalence**

  When do different objects (having different shapes) are seen as having the same shape

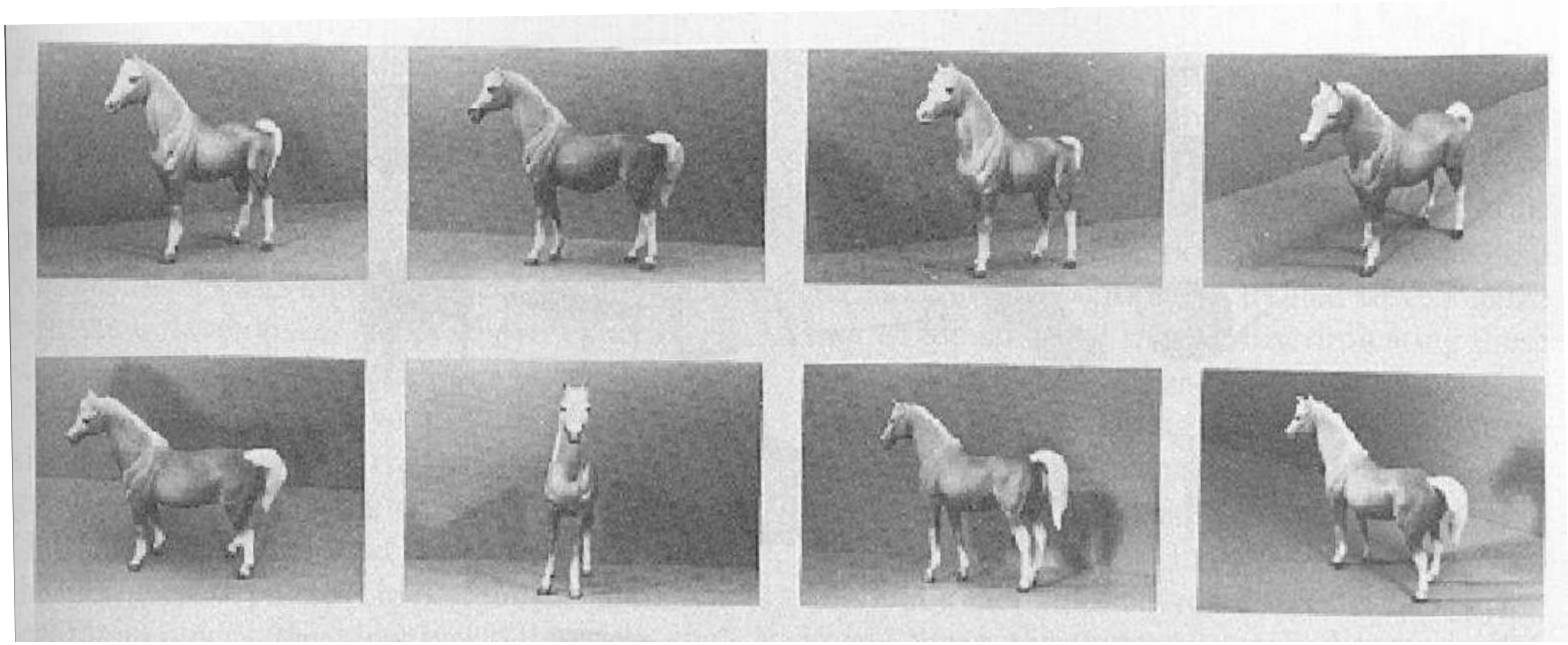
- **How is shape equivalence determined?**

  What information and (algorithmic) operations are involved in determining shape equivalence?

- **Shape and object representation**

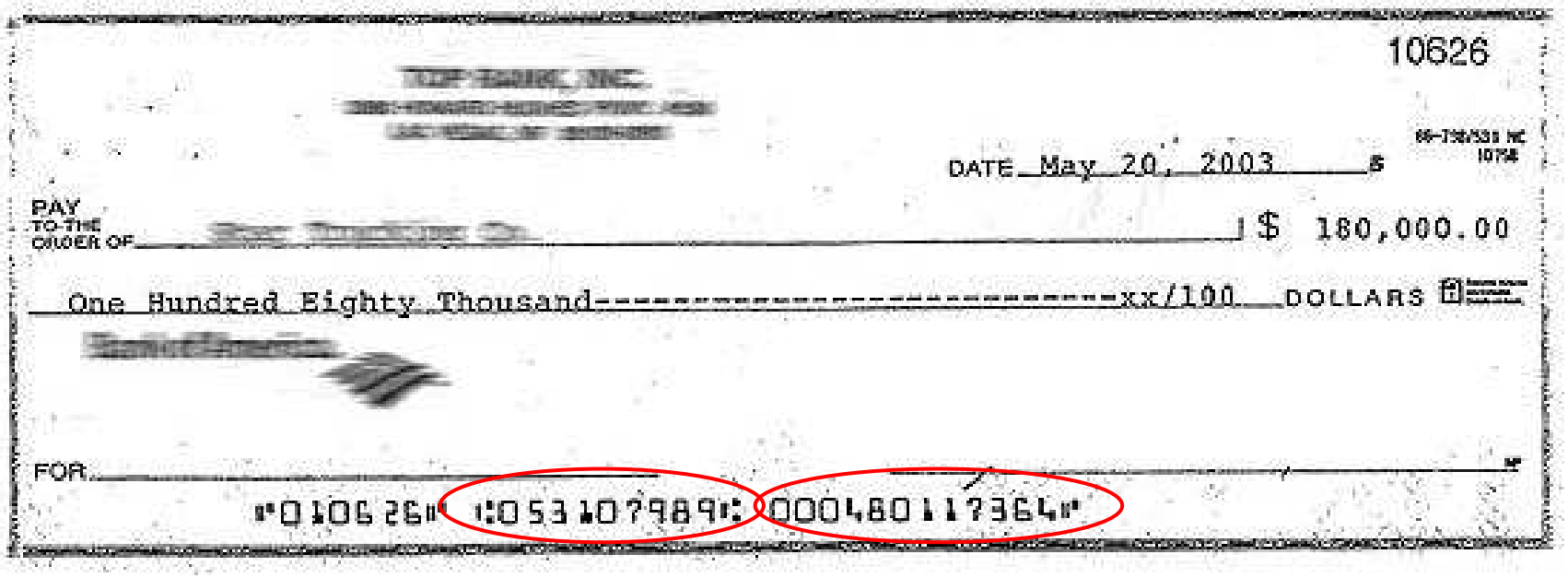
Object identification and recognition

Shape representation – viewer-centered templates



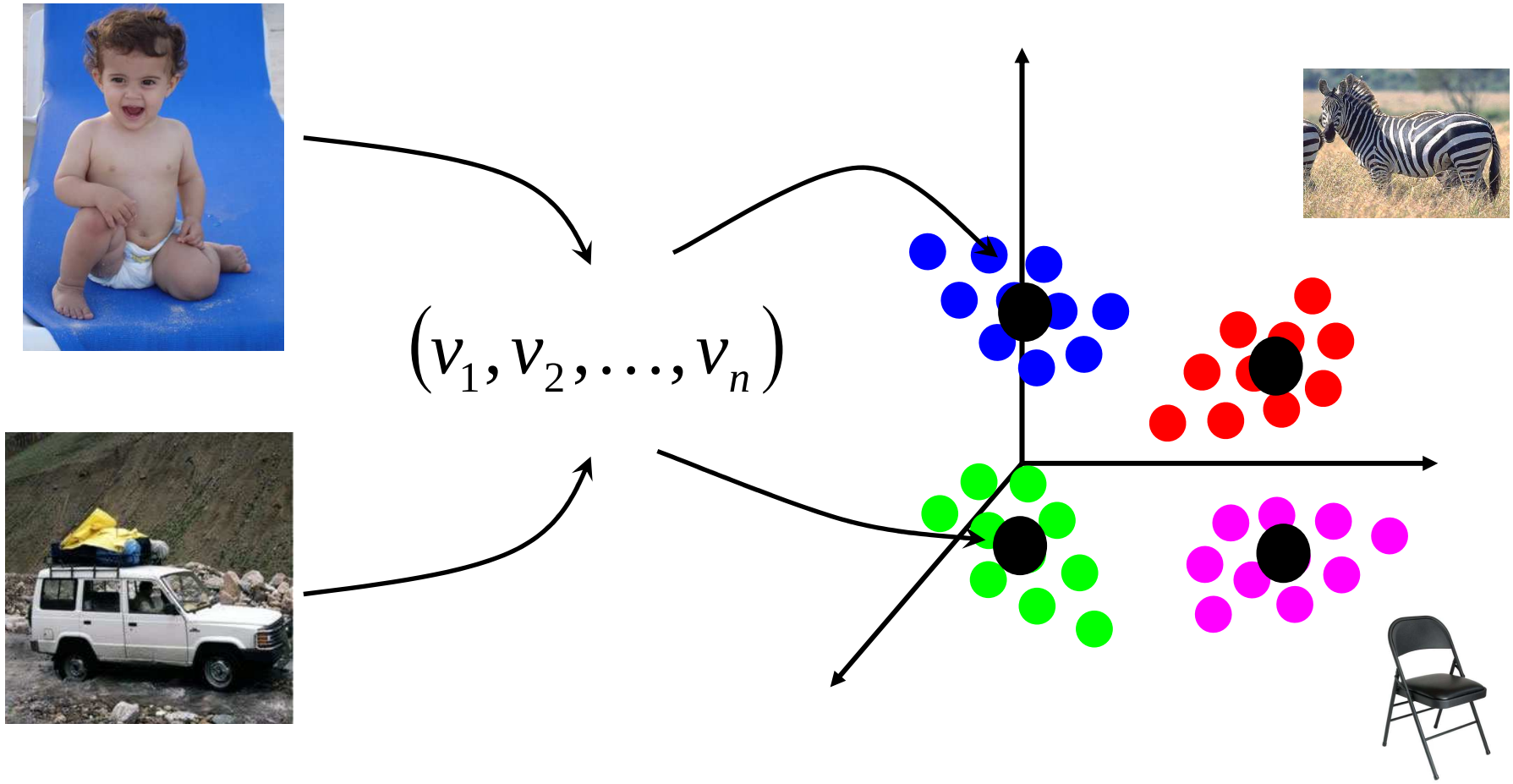
Object identification and recognition

Shape representation – viewer-centered templates



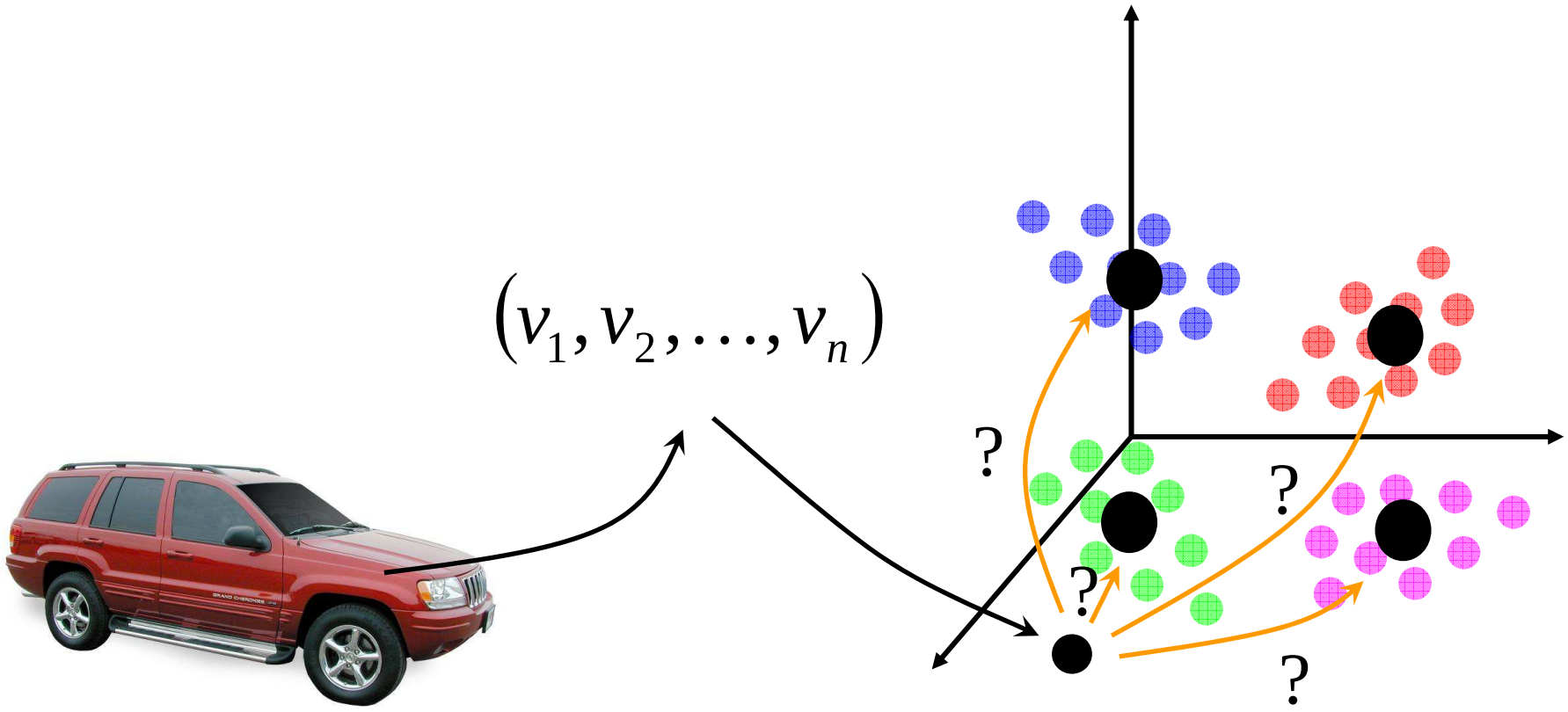
Object identification and recognition

Shape representation – viewer-centered feature vectors



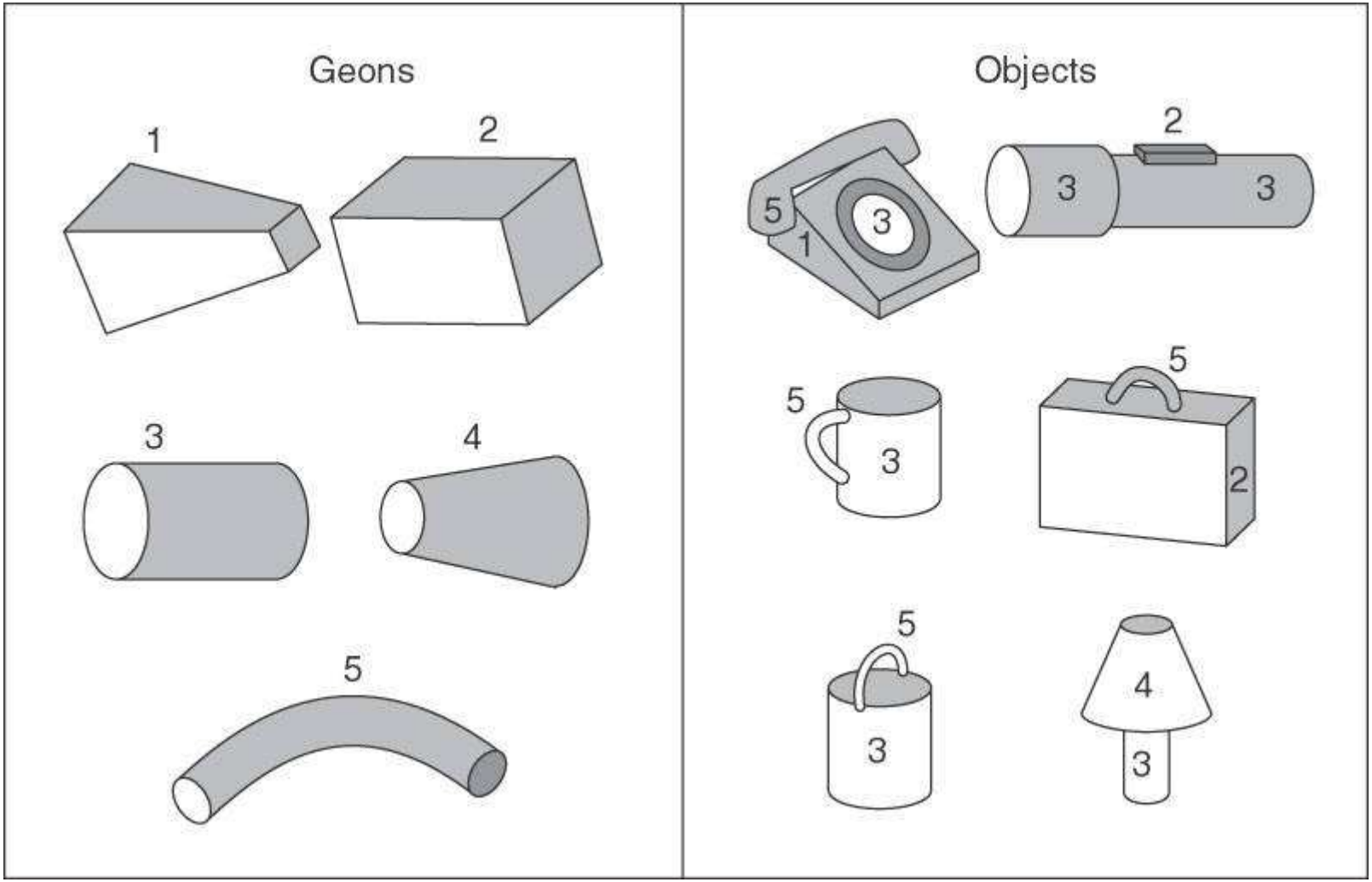
Object identification and recognition

Shape representation – viewer-centered feature vectors



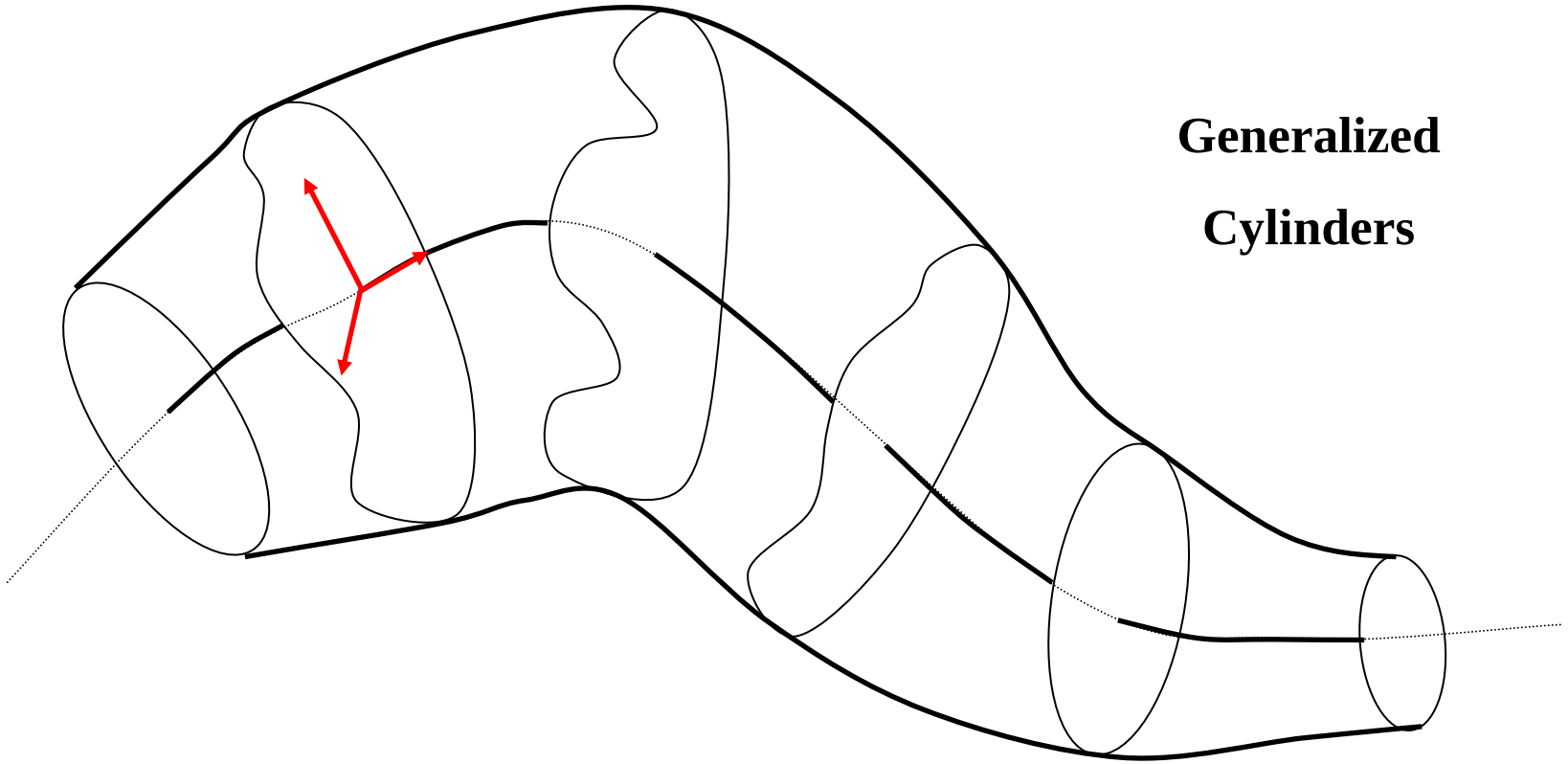
Object identification and recognition

Shape representation – object-centered components



Object identification and recognition

Shape representation – object-centered components

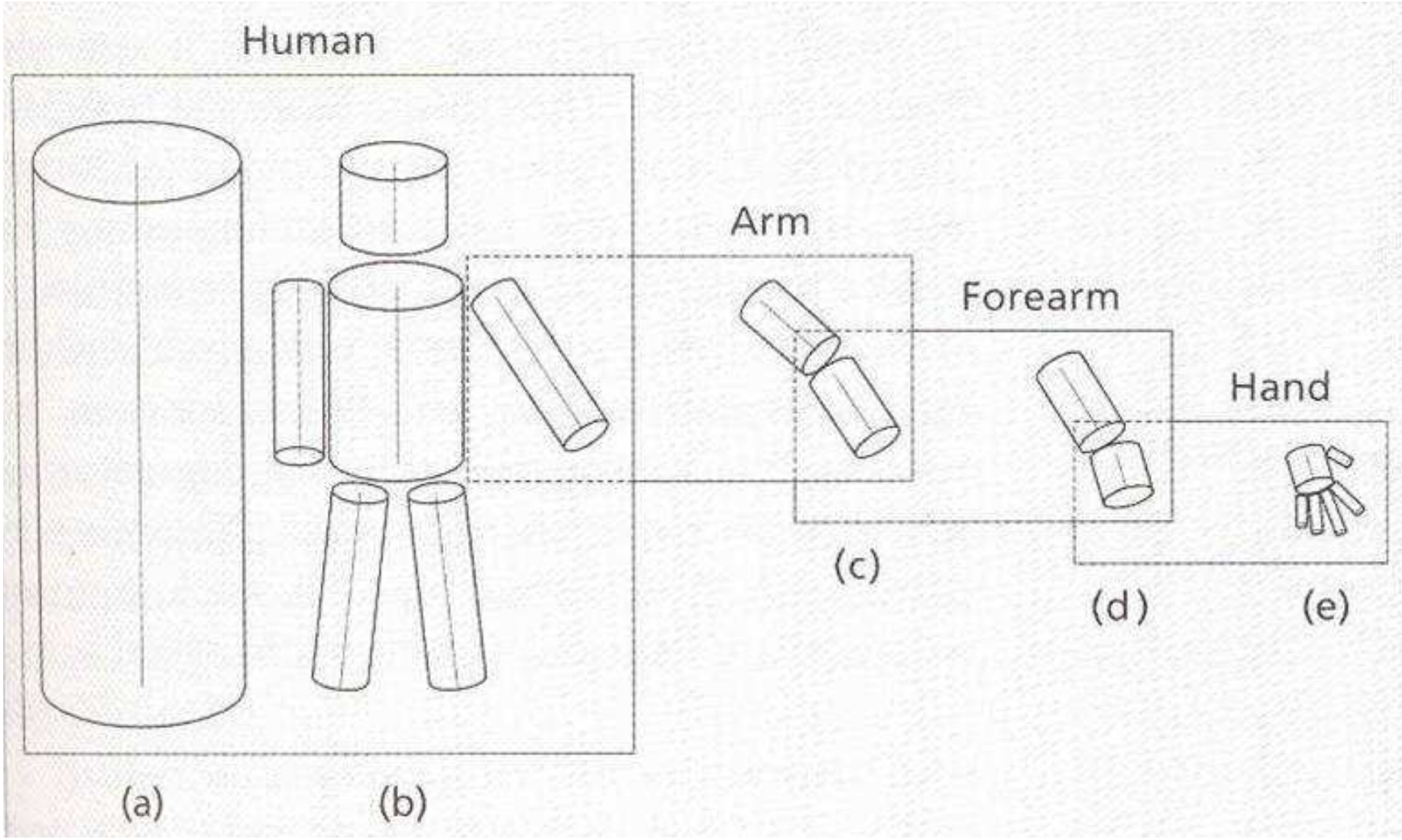


Generalized

Cylinders

Object identification and recognition

Shape representation – object-centered components



Object identification and recognition

Recognition vs. Localization

Recognition

- **What object from the database exists in the image?**
- **Does this database object exist in the image?**

Localization

- **What transformation would map the database object to the measured one.**

Object identification and recognition

Main approaches to recognition

- **Appearance-based**
- **Feature alignment**
- **Parts and structural matching**
- **Shape invariances**