ARAVIND
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Lecture 23
Representation & Descriptions

Segmentation
- → Enhancement
- → Segments in terms of
- → Regions: lines, pixels

} Low level
- → preprocessing
- → extracting primitives

Preprocessing is usually recorded

Image analysis paradigm

Internal vs external

→ Representation: Pixel coords inside region
Description: color, area, texture

Representation: End-point coordinates, polygon

Description: Perimeter, curvature

Both internal and external

- → Image classification
- → Object localization
- → Semantic segmentation
- → Instance segmentation

Boundary following

Given a region R or its boundary, the algorithm for following borders of R: [Number boundary points]

→ let starting point be upper, left most point labeled 1

→ Denote by c_0 the west neighbour b_0, c_0 is always bg point

→ Examine 8-neighbours of b_0, starting at c_0 in clockw

→ let $b = b_1$, $c = c_1$

→ let 8 neighbours of b, starting at c and going in clockwise direction be denoted by $n_1, n_2 \ldots n_8$. first n_k is labelled 1

Descriptor Invariance:

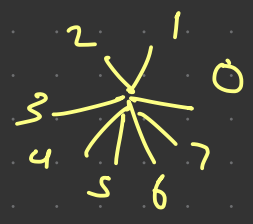
→ Scale, invested, rotation, translation, isotropic scale change

→ Not always ideal

Boundary description

→ Chain code (Freeman chain code)

↳ Downsample



Chain code needs only direction

Initialization

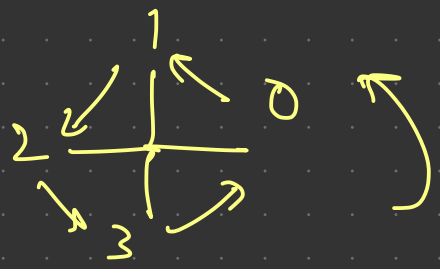
→ Treat code as circular, start with minimum integer

Normalised code:

Gets code corresponding to top left corner. Start from min. integer.

Rotation invariance

Use difference of code



Polygon Approximation

→ Minimum perimeter polygon

↳ Covers boundary with cells of chosen size and forces doubles band like structure to fit inside cells

Boundary description

Fourier descriptors

↳ Boundary as set of points

↳ K-point boundary

2D as 1D

$s(k) = [x(k), y(k)]$

$s(k) = x(k) + j\,y(k)$

DFT of $s(k)$:

$$a(u) = \sum_{k=0}^{K-1} s(k) e^{-j 2\pi u k / K}$$

⇒ Use only P coefficients of inverse DFT

⇒ Obtains smoother boundary