Home Page

Title Page

Contents

Page 27 of 32

Go Back

Full Screen

Close

Quit

Model Adaptation

- An on-line K-Means approx: to update $\mathcal{N}(\cdot)$s
  - Why? Stationary pixel process (time-invariant)? EM for time window (costly) Lighting & scene changes reduce past dependence
  - Either: matches one of the K Gaussians $\sim 2.5\sigma$
  - Or: doesn't match any Gaussians $\sim 2.5\sigma$
- If match with one of the K Gaussians $\sim 2.5\sigma$
  - Update the 3 sets of parameters $\boldsymbol{\mu}_j$, $\boldsymbol{\Sigma}_j$, π_j:
  - $\boldsymbol{\mu}_j$, $\boldsymbol{\Sigma}_j$: linear combo of old & new evidence:
    - $\boldsymbol{\mu}_j^{\tau+1} = (1-\rho)\boldsymbol{\mu}_j^{\tau} + \rho\mathbf{x}^{\tau+1}$
    - $\boldsymbol{\Sigma}_j^{\tau+1} =$ $(1-\rho)\boldsymbol{\Sigma}_j^{\tau} + \rho(\mathbf{x}^{\tau+1} - \boldsymbol{\mu}_j^{\tau+1})^T(\mathbf{x}^{\tau+1} - \boldsymbol{\mu}_j^{\tau+1})$
    - Assume diagonal Cov, ind & same variances

Home Page
Title Page
Contents
Page 28 of 32
Go Back
Full Screen
Close
Quit

- – $* \rho \stackrel{\triangle}{=} \alpha \mathcal{N}(\mathbf{x}^{\tau+1} | \boldsymbol{\mu}_j^{\tau}, \boldsymbol{\Sigma}_j^{\tau})$
    - $*$ α: learning rate. $\alpha = 0 \implies$ no learning, $\rho = 0$
    - $* \boldsymbol{\mu}_j^{\tau+1} = \boldsymbol{\mu}_j^{\tau}$; $\boldsymbol{\Sigma}_j^{\tau+1} = \boldsymbol{\Sigma}_j^{\tau}$
  - Prior weights of *all* Gaussians adjusted:
  - $\pi_j^{\tau+1} = (1-\alpha)\pi_j^{\tau} + \alpha \delta_{j,top\ match}^{\tau+1}$
    - $* \delta_{j,top\ match}^{\tau+1} = 1$: matching Gaussian, 0 ow
  - Renormalise all weights $\pi_j^{\tau+1}$ (only if > 1 best. Grey levels: 2 best equidistant on each side)
    - $* \alpha = 0 \implies \pi_j^{\tau+1} = \pi_j^{\tau}$: no learning
    - $* \alpha = 1 \implies \pi_j^{\tau+1} = 1$: matching Gauss'n, 0 ow
- If $\mathbf{x}^{\tau+1}$ doesn't match any $\sim 2.5\sigma \implies$ something new coming up at this pixel, needs to be put in
  - Least prob ($\sim \pi/\sigma$) replaced with a new one
  - New one: $\boldsymbol{\mu}_j^{\tau+1} = \mathbf{x}^{\tau+1}$, $\boldsymbol{\Sigma}_j$ = high, π_j = low

