Script generated by TTT

Title: profile1 (18.06.2013)

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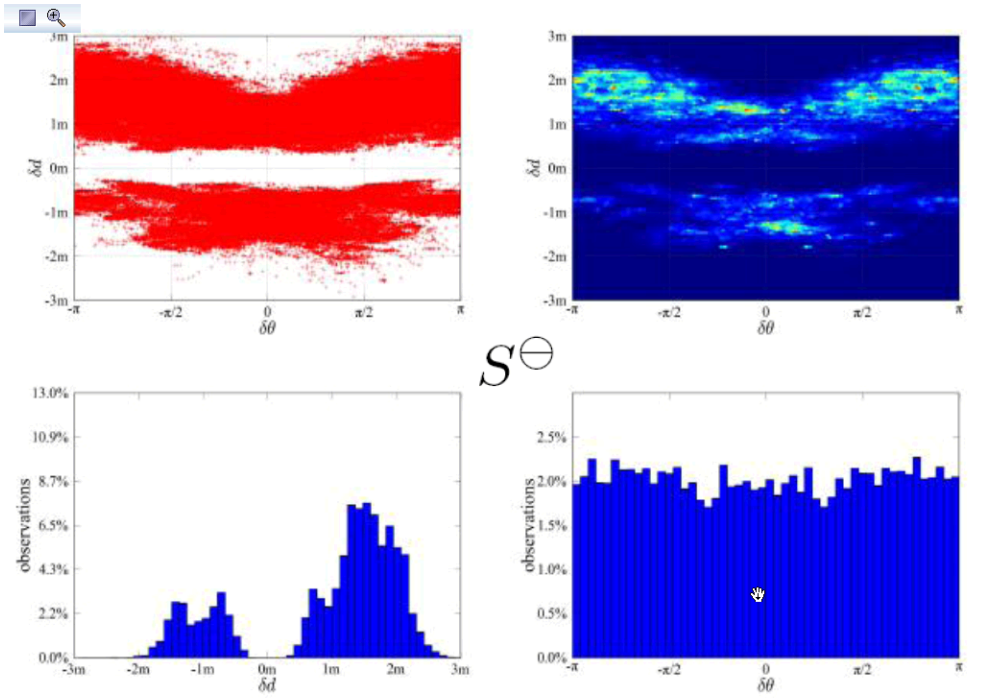


General Structure of Task 4

- main aspect: Social Signal Processing
- task 1: 2 sub-tasks to choose from:
  - task 1.1 Social Situation detection using interaction geometry
  - task 1.2. : face recognition with PCA and KNN
- task 2: develop a concept for applying your choice to a game

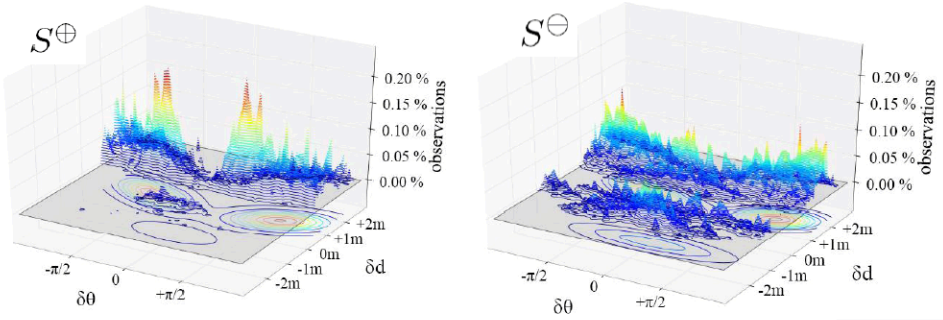
Results

$S^{\oplus} = \{ (\delta\theta, \delta d) \}$ pairs in a social situation

$S^{\ominus} = \{ (\delta\theta, \delta d) \}$ pairs not in a social situation

→ train (EM-algorithm) one Gaussian Mixture Model for $S^{\oplus}$ and one for $S^{\ominus}$

→ $p^{\oplus}(\delta\theta, \delta d)$ and $p^{\ominus}(\delta\theta, \delta d)$



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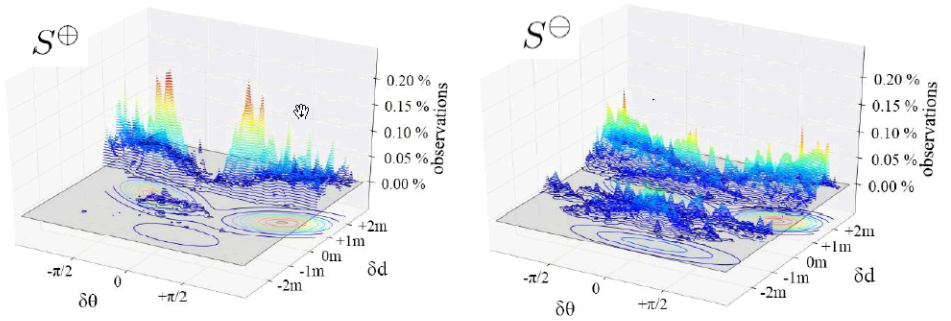
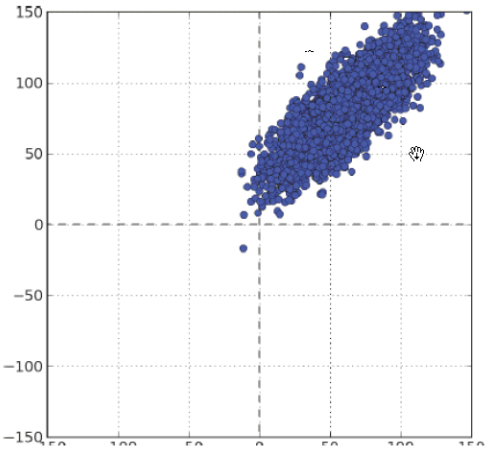


Example



Derivation

- Eigenvalue decomposition of the covariance matrix

$$C = E\Lambda E^T = \begin{pmatrix} e_{11} & \cdots & e_{1n} \\ \vdots & \ddots & \vdots \\ e_{m1} & \cdots & e_{mn} \end{pmatrix} \begin{pmatrix} \lambda_1 & & 0 \\ & \ddots & \\ 0 & & \lambda_n \end{pmatrix} \begin{pmatrix} e_{11} & \cdots & e_{m1} \\ \vdots & \ddots & \vdots \\ e_{1n} & \cdots & e_{mn} \end{pmatrix}$$

where the columns of E denote the eigenvectors of C and each λ the respective eigenvalue

- In case of PCA, the principal components are the ones associated with the highest eigenvalues, hence

$$|\lambda_1| > |\lambda_2| > \ldots > |\lambda_n|$$

Eigenfaces

- Reconsider the general form of the eigenvalue equation

$$\Sigma' x = \lambda x$$

- Substitute $X^T X$ for Σ'

$$X^T X x = \lambda x$$

- Multiply the above equation with X

$$X X^T X x = \lambda X x$$

- Substitute Σ for $X X^T$

$$\Sigma X x = \lambda X x$$