English version - semestral work

Goal

- To create a segmenter able to recognize basic iris classes trained from data aviable below.
- The segmenter can use any **in code listed** library. The main part of segment class should be students own work.
- It is permitted to use ready-made libraries for serving - loading pictures, k-means computing, KNN, etc.
- The used data should be spectral, do not convert them to grayscale!
- C/C++, ideally object based C++. Document your code!
- Write a report (LaTeX, 2 x A4, template), report you chosen method (features + classificator + pre/postprocessing) two test with hit rate of subjects

* The features, pre/postprocessing and clustering method are on your choice.

Hints

1. Read previous works: (en) (cz)
2. Use some preprocessing! There are areas in pictures that have more information than another - or exactly have them in all pictures (look at the wrongly measured pictures). Do not throw away these bad measurements! Good classifiers can separate them.
3. Use features! It is recomended (and easier to implement) to use simplier classificator (k-means, KNN, …) with pre/post processing and features computing. Some interesting features articles are listed below for your inspiration.
4. Test your classifier on 50% training data and 50% testing data ratio **and** on 1 to N-1 ratio.

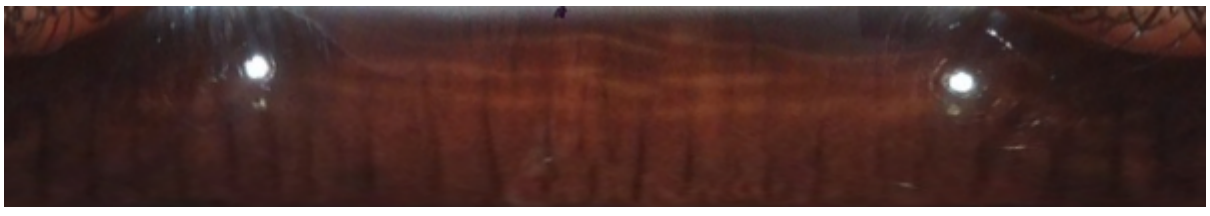
Database

name: 001_ip5_ou_r_ri_01_3

code	meaning
001	class (subject number)
ip5	hw
ou/in	indoor / outdoor
r/l	eight/left
ri	—
3	measure number

Examples

Subject 1:



Subject 1:

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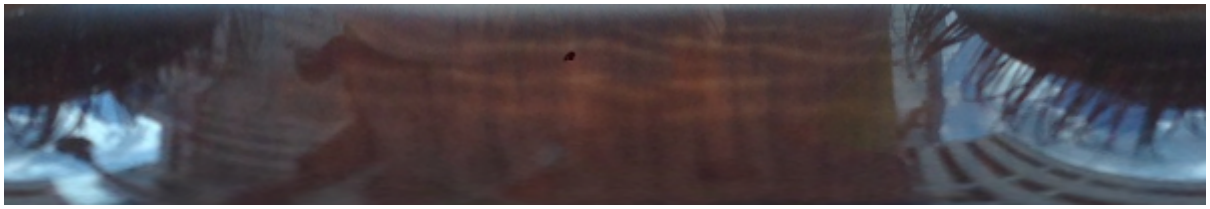
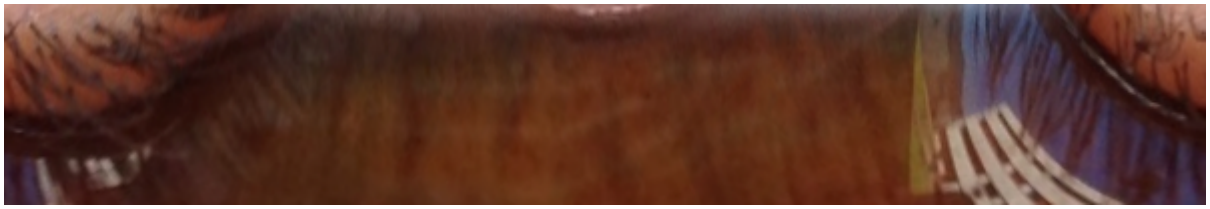


Subject 46:

Subject 4:



All DB: iris.tar

Features

Some articles picked for your inspiration. You are NOT supposed to implement any of them exactly.

Feature	Article
Haralick Co-Occurrence	*R. M. Haralick, K. Shanmugam, I. Dinstein, Textural Features for Image Classication, IEEE Trans. Systems, Man and Cybernetics, 3(6), 1973*
Laws Filter Masks	*K.I. Laws, Rapid Texture Identication, Proc. SPIE Conf. Image Processing for Missile Guidance,1980*
Gabor features	*„Manjunath, B. S. and Ma, W. Y., Texture Features for Browsing and Retrieval of Image Data, IEEE T PAMI, 18(8), 1996| S. Grigorescu, N. Petkov, and P. Kruizinga, "Comparison of texture features based on gabor filters," IEEE Trans. Image Processing, vol. 11, no. 10, pp. 1160–1167, 2002."*
Centralized Binary Pattern	*Fu, X., Wei, W. (2008) Centralized binary patterns embedded with image euclidean distance for facial expression recognition. In The Fourth International Conference on Natural Computation*
Local Derivative Pattern	*Zhang, B. Gao, Y., Zhao, S., Liu, J. (2010) Local derivative pattern versus local binary pattern: Face recognition with high-order local pattern descriptor. IEEE Tr. Image Processing, 19(2), 534-544*
Dominant Local Binary Patterns	*Liao, M. W. K. Law, A. C. S. Chung,Dominant Local Binary Patterns for Texture Classification. IEEE Tr. Image Processing, 18(5), 2009*
Enhanced Local Texture Feature Sets	*Xiaoyang Tan and Triggs, B. Enhanced Local Texture Feature Sets for Face Recognition Under Difficult Lighting Conditions,Image Processing, IEEE Transactions on, 19(6), 2010*
Three-Patch Code	*Wolf, L., Hassner, T., Taigman, Y. (2008) Descriptor based methods in the wild. In ECCV workshop on faces in real-life images: Detection, alignment, and recognition.*
Steerable pyramid features	*many*

Dominant Neighborhood Structure	*Khellah, F.M. Texture Classification Using Dominant Neighborhood Structure, Image Processing, IEEE Transactions on, 20(11), 2011*
Fractal features	*Petrou, J. J. de Mesquita S Junior and A. R. Backes. A simpli ed gravitational model to analyze texture| roughness. Pattern Recognition, 45(2):732 { 741, 2012*
Markovian features	*many*
Run-Length Matrices	*M. M. Galloway, Texture analysis using gray level run lengths, Computer Graphics Image Processing, vol. 4, pp.172-179, 1975.*
SIFT	*D. G. Lowe, Distinctive Image Features from Scale-Invariant Keypoints, International journal of computer vision, 2004*
Wold	*Liu, Picard, R.W. Periodicity, Directionality, and Rand. Wold Features for image modeling and retrieval, IEEE Tr. on PATTERN ANALYSIS AND MACHINE INTELLIGENCE, VOL. 18, NO. 7, |JULY 1996; J.M. Francos,A. Zvi Meiri, and B. Porat, "A Unified Texture Model Based on a 2-D Wold Like Decomposition," IEEE Trans. Signal Processing, pp. 2,665-2,678, Aug. 1993.*
Autocorrelation function	*Petrou*
Covariance features	*San Biagio, Marco and Crocco, Marco and Cristani, Marco and Martelli, Samuele and Murino, Vittori, Heterogeneous Auto-Similarities of Characteristics (HASC): Exploiting relational information for classification, ICCV, 2013*
Textons	*Manik Varma and Andres Zisserman. A statistical approach to texture classification from single images, 2004.*
SURF	*H. Bay and T. Tuytelaars and L. J. Van Gool, SURF: Speeded Up Robust Features, ECCV 2006*
Fourier t.	*many*
Local Binary Patterns	*Ojala, T., Pietikainen, M., Maenpaa, T.: Multiresolution gray-scale and rotation invariant texture classification with local binary patterns. IEEE Trans. Pattern Anal. Mach. Intell. 24(7), 971–987 (2002)*
Completed Linear Binary	*Pattern Guo, Z., Zhang, L., Zhang, D. A completed modeling of local binary pattern operator for texture classification. IEEE Transactions on Image Processing vol. 19, no. 6, 2010.*
LBP Histogram Fourier Features	*Ahonen, T., Matas, J., He, C., Pietikainen, M.: Rotation Invariant Image Description with Local Binary Pattern Histogram Fourier Features. SCIA, 61{70 (2009)*
Tamura features	*H. Tamura, S. Mori, and T. Yamawaki. Textural features corresponding to visual perception. IEEE Trans. on Sys., Man and Cyb., 8(6):460{472, June 1978.*
Weber Local Descriptor	*J. Chen, S. Shan, C. He, G. Zhao, P. M., X. Chen, and W. Gao. Wld: A robust local image descriptor. PAMI, IEEE Transactions on, 32(9):1705 {1720, sept. 2010*
Histogram ration features	*G. Paschos and M. Petrou. Histogram ratio features for color texture classication. PRL, 24(13):309 { 314, 2003.*
Histogram of Oriented Gradient	*N. Dalal and B. Triggs, "Histograms of Oriented Gradients for Human Detection," in Proc. Int. Conf. Computer Vision and Pattern Recognition 2005, pp. 886–893.*

Nonactual past seminar work (Cz only)

Could be used as inspiration for features part.

Hodnocení	Článek	Student	Info
+++	**Local Binary Patterns**	Ondřej Kužela	*Ojala, T., Pietikainen, M., Maenpaa, T.: Multiresolution gray-scale and rotation invariant texture classification with local binary patterns. IEEE Trans. Pattern Anal. Mach. Intell. 24(7), 971–987 (2002)*
+	**Completed Linear Binary**	Šimon Ondráček	*Pattern Guo, Z., Zhang, L., Zhang, D. A completed modeling of local binary pattern operator for texture classification. IEEE Transactions on Image Processing vol. 19, no. 6, 2010.*
+/-	**LBP Histogram Fourier Features**	Ondřej Novák	*Ahonen, T., Matas, J., He, C., Pietikainen, M.: Rotation Invariant Image Description with Local Binary Pattern Histogram Fourier Features. SCIA, 61{70 (2009)*
++	**Tamura features**	Tomáš Duda	*H. Tamura, S. Mori, and T. Yamawaki. Textural features corresponding to visual perception. IEEE Trans. on Sys., Man and Cyb., 8(6):460{472, June 1978.*
+++	**Weber Local Descriptor**	Haur Vojtech	*J. Chen, S. Shan, C. He, G. Zhao, P. M., X. Chen, and W. Gao. Wld: A robust local image descriptor. PAMI, IEEE Transactions on, 32(9):1705 {1720, sept. 2010*
++/-	**Histogram ration features**	Jan Vesely	*G. Paschos and M. Petrou. Histogram ratio features for color texture classication. PRL, 24(13):309 { 314, 2003.*
+/-	**Histogram of Oriented Gradient**	Jakub Svehla	*N. Dalal and B. Triggs, "Histograms of Oriented Gradients for Human Detection," in Proc. Int. Conf. Computer Vision and Pattern Recognition 2005, pp. 886–893.*

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