

Advances on Feature Selection Techniques with Applications to Face Recognition

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Contributions of the Master Dissertation

We have achieved some original contributions during the development of this project, which are explained in the following. Our first step consisted of exploring basic concepts of pattern recognition (mainly feature extraction and classification techniques), in which we have performed experiments on leaves classification using contour information [de Campos et al., 1999]. Afterwards we have studied dimensionality reduction methods for face recognition by assessing the effects of modular recognition, comparing the classification performance using eyes-only images versus full face images. The results were evaluated indicating the directions to be followed in the thesis [de Campos et al., 2000b]. In those experiments, we have used PCA as a feature extractor.

We have proposed a face \times non-face discriminator based on the 1-D Fourier transform [de Campos et al., 2000a], and its extracted patterns have been used to evaluate feature selection strategies [de Campos et al., 2000d]. The development of that project included some interaction with Dr. P. Pudil (A.S., Czech Republic) and his group, responsible for the development of the automatic feature selection search methods that we have employed (SFFS). We have also performed automatic feature selection experiments using the principal components of eyes images [de Campos and Cesar-Jr, 2001].

Having evaluated the searching algorithms for feature selection, our next step was to develop a new criterion function in order to circumvent the main problems we found with the existing methodologies. Our new criterion function was initially evaluated on two-classes simulated data [de Campos et al., 2001]. That work was accomplished in collaboration with Professor Isabelle Bloch (ENST, France). We then generalised the criterion function to be applied to problems with multiple classes [Ashimine et al., 2002]. This

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latter problem remained as a research topic of the Vision Group at IME, where the MSc thesis was developed, based on which another MSc student is currently developing his thesis. This research is a collaboration between Roberto Cesar, Teófilo Campos, Isabelle Bloch and the new MSc student Jishu Ashimine.

Finally, we proposed a framework for face recognition from video sequences which employs a facial feature tracker, modular recognition and feature selection [de Campos et al., 2000c]. Further collaborative work has been done on developing a face tracker [Feris et al., 2000]. We have also presented our research for undergraduate students in a 4 hours tutorial at “Coloquio de Incentivo à Pesquisa” (in 1999) and an 8 hours tutorial [de Campos et al., 2000e] at “Semana da Computação”, both of them at UNESP.

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