

## ADAPTIVE DATA-DEPENDENT MATRIX NORM BASED GAUSSIAN KERNEL FOR FACIAL FEATURE EXTRACTION

JUN-BAO LI

Department of Automatic Test and Control  
Harbin Institute of Technology  
Harbin 150001, P. R. China  
junbaolihit@hotmail.com

SHU-CHUAN CHU AND JIUN-HUEI HO

Department of Information Management  
Cheng Shiu University  
840, Cheng Cing Road, Kaohsiung County 83347, Taiwan  
schu@bit.kuas.edu.tw; jhho.csu@msa.hinet.net

JENG-SHYANG PAN

Department of Electronic Engineering  
National Kaohsiung University of Applied Sciences  
415, Chien Kung Road, Kaohsiung City 80778, Taiwan  
jspan@cc.kuas.edu.tw

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**ABSTRACT.** *In this paper, we propose a novel kernel named Adaptive Data-dependent Matrix Norm Based Gaussian Kernel (ADM-Gaussian kernel) for facial feature extraction. As a popular facial feature extraction method for face recognition, the current kernel method endures some problems. Firstly, the face image must be transformed to the vector, which leads to the large storage requirements and the large computational effort, and secondly since the different geometrical structures lead to the different class discrimination of the data in the feature space, the performance of the kernel method is influenced when kernels are inappropriately selected. In order to solve these problems, firstly we create a novel matrix norm based Gaussian kernel which views images as matrices for facial feature extraction, which is the basic kernel for the data-dependent kernel. Secondly we apply a novel maximum margin criterion to seek the adaptive expansion coefficients of the data-dependent kernel, which leads to the largest class discrimination of the data in the feature space. Experiments on ORL and Yale databases demonstrate the effectiveness of the proposed algorithm.*

**Keywords:** Kernel method, Gaussian kernel, Matrix norm based Gaussian kernel, Adaptive matrix norm based Gaussian kernel, Data-dependent kernel

1. **Introduction.** Face recognition and its relative research [1-3], have become the very active research topics in recent years due to its wide applications. An excellent face recognition algorithm should sufficiently consider the following two issues: what features are used to represent a face image, and how to classify a new face image based on this representation. So the facial feature extraction plays an important role in face recognition. Among various facial feature extraction methods, the dimensionality reduction