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Heterogeneous Facial Analysis and Synthesis

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Contents

Acronyms

AAM	Active appearance model
ADFL	Adversarial discriminative feature learning
AG	Age group
ARDL	Adversarial residual dictionary learning
BLAN	Bi-level adversarial network
CAFP-GAN	Couple-agent face parsing GAN
CAPG-GAN	Couple-agent pose-guided GAN
CNN	Convolutional neural network
FAR	False accept rate
FCENet	Face completion and editing network
FESN	Facial expression synthesis network
FLOPS	Floating-point operations per second
FPPN	Face parsing prediction network
G2-GAN	Geometry-Guided GAN
GAN	Generative adversarial network
GSNet	Global specific network
HF-PIM	High fidelity pose invariant model
HFR	Heterogeneous face recognition
HG	Hourglass
HR	High-resolution
LI	Lateral inhibition
LR	Low-resolution
LSNet	Local specific network
MFM	Max-feature-map
MSE	Mean squared error
MUP-D	Makeup portrait disentanglement
NIR	Near-infrared
ReLU	Rectified linear unit
SAMC	Semantic-aware makeup cleanser
SAT	Semantic-aware texture

SISR	Single image super-resolution
SR	Super-resolution
TIR	Thermal infrared
TP-GAN	Two-Pathway GAN
VAE	Variational auto-encoder
VGG	Oxford Visual Geometry Group
VIS	Visual
WaveletGLCA	Wavelet-domain global and local consistent age
WT	Wavelet transform

Chapter 1
Introduction

Abstract This chapter gives an overview of the heterogeneous problem in facial analysis as well as its synthesis solution, followed by a brief outline of the rest chapters. We start from the background and challenges in research of heterogeneous facial analysis. Then the heterogeneous facial synthesis is emphasized as one of the promising and effective solutions. The instantiated tasks to be elaborated in the following chapters are finally introduced in a compact manner.

1.1 Overview

1.1.1 Heterogeneous Faces

In practice, human face appearance is often influenced by many factors, even in terms of the same person. These factors include viewing angles, expressions, makeup, age and etc. Face images with a certain factor value may constitute a certain image domain. Taking the age factor as an instance, face images at 10 years old and 30 years old are divided into two domains according to the age. The heterogeneous facial problem refers to tackling face images across different domains. Accordingly, the erratic domain gaps inherently make the problem quite challenging to settle.

In general, recent research mainly meet challenges from two aspects. The first issue comes from the lack of available data resource, making it a low-shot learning problem. Since each domain only contains qualified data (usually limited to a certain value of a factor), it is unfeasible to collect massive and abundant data for each domain. Coupled with the requirement of multi-domain data from the same person for tasks as heterogeneous face recognition, applicable data becomes even more rare. The second challenge lies in the inevitable disorganization inside each domain. Except for the studied factor, all other factors are noises that bring about unpleasant variations. For example, when we are studying the factor of age, changes in viewing angles and makeup lead the task to a more complex one. We conclude it as the in-the-wild problem, for most involved data is obtained under unconstrained conditions.

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