

## INTRODUCTION

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Image feature extraction and image recognition, as the most difficult and critical steps in visualization, play a key role in computer vision systems. Feature extraction refers to the computer-aided extraction of image information, followed by judging whether a point is a feature of the image. After feature extraction, the points on the image are divided into different subsets, which tend to be isolated points, continuous curves, or continuous areas.

Features are an interesting aspect of digital images. It is the starting point of many computer image recognition algorithms. The success of an image recognition algorithm depends on how it uses and defines image features. Reproducibility is one of the most important properties of image feature extraction, that is, the features extracted from different images of the same scene should be the same.

The existing image feature extraction techniques are grounded on different bases, ranging from expert knowledge, image local structure, image global structure and machine learning statistics. To grasp the latest techniques and trends in image feature extraction and image recognition, we solicited contributions themed “New Trend of Image Recognition and Feature Extraction Technology” since February 2018, receiving a total of 56 submissions. After several rounds of careful review, ten excellent papers were selected as the winners of this solicitation, all of which provide innovative and advanced image feature extraction methods. In this collection, these methods are applied to solve various practical problems, such as fingerprint verification, gesture recognition, building recognition, and vehicle identification. These representative application examples demonstrate the latest ideas, principles, methods, and advancement of feature extraction and verify the feasibility of the said methods.

The article “A novel image enhancement technique for tunnel leakage image detection” applies image feature extraction and image recognition in engineering projects. Based on wavelet transform, the paper proposes an image enhancement algorithm to solve the problems of existing leakage image treatment techniques. The proposed method was verified through Matlab simulations on an actual tunnel leakage image, and compared quantitatively with a traditional enhancement algorithm through image normalization. The results show that the algorithm can satisfactorily overcome the defects of the traditional method and produce leakage images with sharp contrast, bright lightness and clear textures. The research findings lay a solid theoretical basis for the fast and accurate identification of images on leakage disease.

The automatic recognition of vehicle image features is an important research direction in the field of intelligent transport. However, there might be difference in the features extracted from several images of a vehicle in the same scene, because the moments of vehicle image features differ in magnitude. The author of “A novel

vehicle feature extraction algorithm based on wavelet moment” proposed a feature extraction algorithm based on wavelet moment method. Relying on the principle of invariant moment and wavelet energy, the algorithm greatly improves the recognition rate of image extraction of actual vehicle images, shedding new light on image classification and recognition.

In multi-modal human-computer interaction, gesture recognition opens a new field in addition to face recognition, speech recognition, and motion tracking. The gesture segmentation effect in complex background directly bears on the real-time performance of resource-constrained mobile devices. In the article “An improved mixed Gaussian-based background modelling method for fast gesture segmentation of mobile terminals”, the author put forward a detection method based on improved mixed Gaussian background modelling. The method can rapidly eliminate environmental interferences, achieve effective hand segmentation in real time and ensure the good computing performance of the mobile device, despite the massive changes to the background scene.

The article “Binocular visual positioning under inhomogeneous, transforming and fluctuating media” aims to disclose the effects of abnormal media on binocular vision positioning. The model of binocular visual positioning established in the paper provides an effective solution to the media transforming and inhomogeneity, and charts a new course for accurate vision positioning in highly complex environments.

The article “Orientation holes positioning of printed board based on LS-Power spectrum density algorithm” proposes a new frequency domain hybrid extraction method, which works effectively in punched hole recognition and directional hole positioning and outperforms the existing positioning techniques in accuracy.

Image feature extraction and image recognition enjoy broad application prospects in practical engineering. In road maintenance, the accurate crack detection is essential to road condition evaluation, maintenance and management. In the article “A novel asphalt pavement crack detection algorithm based on multi-feature test of cross-section image”, a crack detection algorithm is proposed through the multi-feature test of cross-section image. The algorithm overcomes the inaccuracy in crack detection by cross-section images arising from low contrast and complex pavement texture. The experimental results show that the algorithm can achieve a high accuracy in the detection of pavement cracks.

Image recognition technologies have been widely used in architectural modeling. The article “Reconstruction of 3D building model based on the information in floor plan” attempts to reconstruct the 3D model of buildings via image recognition based on the information of building components and internal space in the floor plan. The pre-processing algorithm proposed in the paper can eliminate the redundancy lines in the floor plan, detect the internal subspace through the closed-loop self-check algorithm, and thus effectively reconstruct 3D models of buildings.

Image feature extraction and image recognition have also been widely adopted to process medical images. The article “A brain nuclear magnetic resonance image

segmentation algorithm based on non-rigid registration”, considering the vital role of nuclear magnetic resonance (NMR) in brain disease analysis, develops a non-rigid registration algorithm integrating intensity and shape features for multi-object segmentation. The experimental results show that the algorithm can achieve desirable results in segmentation of internal structures of the brain.

In the article “A novel video target tracking method based on lie group manifold”, an innovative video target tracking algorithm is created, which describes the target features with covariance matrix and derives the state equation and observation equation of the particle filter (PF) algorithm under the Riemannian manifold. The algorithm enjoys good robustness despite target occlusion and target deformation, offering a brand-new solution to various applications based on target tracking.

Fingerprint image matching and fingerprint recognition algorithm are two important issues of automatic fingerprint recognition systems. However, the traditional fingerprint acquisition methods face such problems as image deformation, alignment difficulty and low resolution. The article “An improved fingerprint image matching and multi-view fingerprint recognition algorithm” proposes a multi-view fingerprint image acquisition method that can effectively prevent the deformation of fingerprint images, accurately distinguish between matched and unmatched details, thereby enhancing the accuracy of fingerprint recognition and matching.

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