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An Improved Active Shape Model Application on Facial Feature Localization

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ABSTRACT

An improved active form model is projected during this paper. The projected algorithmic program includes the subsequent four aspects. Firstly, this paper adopts a semi-automatic facial feature points marking tool. Secondly, this paper proposes to extract 2nd gradient feature on the very best level and also the higher level of multi-resolution pyramid pictures, and use physicist ripple transformation to extract very cheap level's 2nd texture feature. Thirdly, this paper adopts a brand new methodology of decomposition of multi-resolution pyramid. Pyramid pictures square measure got by ripple transformation. Finally, this paper uses associate improved looking out theme of multiresolution pyramid. The length of 2nd profile looking out parallelogram is modified per totally different pyramid levels. Experimental results demonstrate that the projected algorithmic program exhibits higher performance than the initial ASM.

1. INTRODUCTION

Facial feature extraction is a vital method in facial image analysis. It are often accustomed face recognition and verification, facial animation, face compression, etc.Important countenance embody the face contour, eyes, eyebrow, nose, mouth, etc [1]. several approaches are projected for the extraction of those countenance in recent years, and also the highest attention has been given to active form model (ASM) and active look model (AAM). The active form model (ASM), projected by Cootes and Taylor, has attracted a lot of attention in several areas of feature extraction, like for medical pictures, face pictures, hand gestures, etc. as a result of ASM captures the precise characters of a form and its variations square measure denoted by a applied math form model, it will thus adapt to any predefined shapes a lot of effectively and accurately. though original ASM algorithmic program will get sensible convergence ends up in several cases, it strongly relies on the position of initialization of mean shape model. When the mean shape model is far from the real face contour, it is prone to get a bad local convergence result. At the stage of searching for target points, the original ASM algorithm only uses the local gray profile model around landmark to ensure the accuracy of localization of feature points, which makes the localization result easily occur error. Besides, if the light condition of target images is largely different from that of training images, it will cause the built gray profile model can't guide the move of feature points rightly, which makes the algorithm not converge, and the localization result of feature points not ideal, even localization failure. On account of those above defects, Du Chen introduced the edge information and part information of face to the matching process of ASM which improved the performance of ASM [2].Fanyuhua used log-Gabor coefficients to describe the local texture distribution and built models for each feature point to increase the robustness to illumination change and other noises [3]. during this paper, an improved active shape model is proposed after deeply researching the original active shape model. The projected algorithmic program includes the subsequent four aspects. Firstly, this paper adopts a semiautomatic facial feature points marking tool. Adoption of the marking tool greatly reduces the burden of marking points. Secondly, this paper proposes an improved 2D texture model, that is predicated on physicist ripple coefficients and gradient feature. we have a tendency to propose to extract 2nd gradient feature on the very best level and also the higher level of multi-resolution pyramid pictures, and use physicist ripple transformation to extract very cheap level's 2nd native texture feature. This methodology makes facial feature points localization a lot of correct. Thirdly, we have a tendency to improve the multi-resolution pyramid's decomposition methodology of the initial active form model. This paper proposes to use ripple transformation to induce pyramid sub-images. Finally, this paper modifies the multi-resolution looking out theme of the initial active form model. we modify the length of 2nd profile looking out parallelogram per totally different pyramid levels within the projected algorithmic program.

The organization of this paper is as follows. In Section a pair of, we offer a quick introduction of the initial active form model. Our improved ASM is introduced in Section three. Experimental results and also the performance comparisons square measure given in Section four, and a conclusion is drawn in Section five.

2. THE IMPROVED ACTIVE FORM MODEL ALGORITHMIC PROGRAM

A. Adoption of A Semi-Automatic Facial Feature Points Marking Tool The

ASM algorithmic program must be marked variety of coaching pictures manually at the training stage. every coaching image ought to be marked variety of feature points. Thus, feature points marking becomes timeconsuming. during this paper, we adopt a semi-automatic facial feature points marking tool, which greatly reduces the burden of marking points.Fig.2 is our adopted semi-automatic facial feature points marking tool.

Our adopted feature points marking tool has the following characters.

- We can load two images at the same time. So, we can mark them at the same time.
- We can mark feature points either on the first image or on the second image.
- The marking tool has the function of position prediction of feature points.

If we mark point on one of the two images, the corresponding point will occur on the corresponding image automatically. This function greatly improves marking efficiency. However, this position prediction function is based on the geometrical position of marked points, thus sometimes position prediction is not accurate enough and it needs us to adjust the position manually.

B. The Modified 2D Texture Model Based on Gabor Wavelet Coefficient and Gradient Feature

The original ASM uses 1D gray profile of the feature point as the match feature, and its computation complexity is relatively low, but sometimes its localization accuracy is not high. Gabor wavelet coefficient can provide rich local-texture feature information and thus leads to accurate feature point localization, but with the drawback that it may add computation complexity. Reference [7] divided facial feature points into fiducial points and contour points. In that paper, the author extracted Gabor feature for fiducial points, and gray feature for contour points. Its localization accuracy was not high because only the 1D local texture feature was extracted and its feature expression method was relatively single. Reference [8] used gray and Log-Gabor feature to express local texture feature together. Though the author combined 2 different kinds of texture feature, he still extracted 1D feature and could not ensure high localization accuracy. additionally, extracting Log-Gabor feature for all the feature points added computation complexity. According to the basic idea of multi-resolution pyramid searching strategy of the original ASM, in the upper levels of the pyramid, only estimated values for model fitting are determined. At the lowest level of the pyramid, the final model fitting values for the original images are computed. That is to mention, a coarse-to-fine searching strategy is adopted. In the upper levels of the pyramid, the feature points are coarsely localized .And at the lowest level of the pyramid, the feature points are finely localized. So, we have a tendency to adopt the following 2 steps to build native texture feature model. the primary step: Extraction 2nd gradient feature – the initial ASM algorithmic program perpetually builds native grey applied math property of feature points' neighbor space .That is to say, the gray-level model is that the normalized spinoff of the profiles sampled perpendicular to the feature purpose contour and focused at the feature purpose. Experimental results show that to get comfortable applied math data wants an oversized variety of coaching pictures if we have a tendency to extract grey feature as native feature. additionally, grey feature's hardiness to illumination is worse than gradient feature [8]. scale to cut back the influence of illumination to localization accuracy and reduce the amount of coaching pictures, this paper proposes to extract 2nd gradient feature on the very best level and also the higher level of multi-resolution pyramid pictures, as a result of grey feature is extremely sensitive to illumination and also the variety of coaching pictures is proscribed.

C. A changed Multi-Resolution Pyramid Decomposition methodology

At the coaching and looking out stage of ASM on mutiresolution frame, original ASM algorithmic program adopts the subsequent methodology to induce pyramid pictures of coaching image. First, let coaching image pass a mathematician filter, so sample the filtered image in interval. The resolution of those pictures decreases step by step. the dimensions of the latter scale image is 1/2 that of the previous scale image. The pyramid sub-images obtained by this methodology, whose fine feature can get less and fewer because the resolution decreases. So, it counts against extracting made texture feature and influences the feature localization accuracy. ripple transformation has multi-resolution character. It will extract made data from pictures effectively and notice adaptation analysis of pictures. exploitation ripple transformation to create pyramid pictures has several blessings [10].

3. EXPERIMENTAL RESULTS AND ANALYSIS

Our experiment is predicated on IMM and ORL face info. we elect two hundred pictures as coaching pictures. we elect one hundred pictures as check pictures. All the pictures for coaching and check square measure neutral expression of frontal face. we have a tendency to mark fifty eight facial feature points for every coaching image manually. In this paper, we have a tendency to mark the feature points at the outer contour of face and also the edges of every face part. Usually, an oversized profile looking out length is required for strong data formatting and sensible feature points localization. However, a large profile looking out length might create matching results worse as a result of associate inappropriate face form are often thought-about because the original face form. In addition, it should add feature points localization time if the profile looking out length is just too giant. supported on top of causes and per the sensible size of IMM and ORL face database' face pictures, we have a tendency to check over and yet again and at last set the 2nd profile searching-rectangle length is four of the primary level, eight of the second level, and sixteen of the third level. The displacement threshold T is about to be one on the primary level.

4. CONCLUSION

In this paper, a changed active form model is projected to enhance the performance of the initial active form model. The proposed algorithm includes the following four aspects. Firstly, this paper adopts a semiautomatic facial feature points marking tool. Secondly, this paper proposes to extract 2nd gradient feature on the very best level and also the higher level of multi-resolution pyramid pictures, and use physicist ripple transformation to extract very cheap level's 2nd texture feature. Thirdly, this paper adopts a brand new methodology of decomposition of multiresolution pyramid.

Experimental results show that our projected ASM algorithmic program has created grate improvement on localization accuracy and interval than that of the initial ASM.However, as a result of the coaching pictures square measure neutral expression of frontal face, therefore the experimental results additionally show that our projected algorithmic program might fail once faces have little angular deflection. the way to create the projected algorithmic program a lot of strong of face's angular deflection is a vital direction for our future study.

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