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Quality Image Check in a Mobile Environment

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ABSTRACT

The aim of this project is to measure the level of focus and to identify the areas of the skin with high levels of Specular-reflection that are uploaded to the BTBP mobile application for skin analysis. Measuring this information makes it possible to give the user feedback on the quality of their image capture, and how to improve future captures. Specular-Reflection is excessive reflection from the skin's surface has a detrimental effect on skin analysis. In order to avoid such problems we need to identify areas of intense Specular-Reflection and eliminate those areas from analysis. The concept used here is histogram analysis.

Each time an image is captured, the camera's auto-focus is used to try and achieve optimal focus. Occasionally this can fail and result in an image that is out-of-focus and therefore undesirable In order to reject these images, focus level quantification is necessary. Referring to the edge information of the objects in the image, calculate the level of sharpness in the image. Filtering and image enhancement concepts will be used for this implementation. This will be implemented using the C# platform and will utilize the Open CV library. This includes learning about Image declarations, image data reading and assigning in C#.

Keywords: Specular-reflection, histogram analysis

1. INTRODUCTION

Digital image processing is the use of computer algorithms to perform image processing on digital images. Digital images processing has many advantages over analog image processing it allows a wider range of algorithms to be applied to the input data, and avoid problems such as the build-up of noise and signal distortion during processingand hence can offer both more sophisticated performance at simple tasks, and the implementation of methods which would be impossible by analog means.

Image Quality is a characteristic of an image that measures the perceived image degradation (typically, compared to an ideal or perfect image. An ideal model of how a camera measures light is that the resulting photograph should represent the amount of light that falls on each point at a certain point in time. This model is only an approximate description of the light measurement process of a camera, and image quality is also related to the deviation from this model. In this thesis we discuss preprocessing methods to solve the most common problems in face images, due to a real capture system, like lighting variations, focus level.

2. METHODOLOGY

Referring to the edge information of the objects in the image, we will calculate the level of sharpness in the image. Filtering and image enhancement concepts will be used for this implementation.We are going to do this using the C# platform and will utilize the Open CV library. Project work includes learning about Image declarations, image data reading and assigning in C#.

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The Proposed tool is created to check whether the image captured by the camera is appropriate for facial skin analysis. We are checking quality of image by considering focus (either blurred or non-blurred), specular reflection in a facial images. As these factors have a determinable effect on facial skin analysis. In order to eliminate those areas we have proposed this method.

This method is divided into following steps:

- Face Cropping using Haar cascades
- Detecting the Blur grade(Focus)
- Eliminating the specular reflected areas

2.1. Testing on our Opencv_2.3.1_prototype application

Using this new side profile trained Frontal face cascade.xml file, tested in our opencv 2.3.1 prototype app application. The output results are

Figure 1: Rectangles detection

2.2. Detecting the Focus Level (Blurriness) in image

Broadly speaking, the blurriness or sharpness of imagescan be measured in various ways. The concept here we are using is averaging filter concept, where the image under test is smoothened dynamically selecting the averaging filter size accordingly to size of image. Comparison of these two images determines whether the image is blurred or not.

In dynamic smoothening we considered two factors one for number of iterations and one for filter size with respect to the image width so that large size image are smoothened better to get accurate results.

As we discussed in image quality assessment about the reduced reference metrics where we extract some features in test image. Considering those features comparison is made between the image under test and characteristics are calculated.

Here, the test image is smoothened (averaging filter), then the test image is subtracted from smoothened image so that the resulted image contains the information of the edges. We have run this algorithm on several images both blurred and non-blurred, the outcome showed that a non-blurred image had more number of pixels present than in the blurred image.

From this observation we calculated the average pixels in all images, according to this data we have concluded that image which are blurred had very low number of average pixels compared to non-blurred. Hence we calculated the threshold to be 4 i.e, if either number of R, G, B pixels is less than 4 then the image is blurred. According to data we acquired we created a blurring metrics which tells the grade of blurriness in image, we considered the scale from 0 to 10 as there is no large deviation of the minimum values obtained from image to image.

Flow Chart

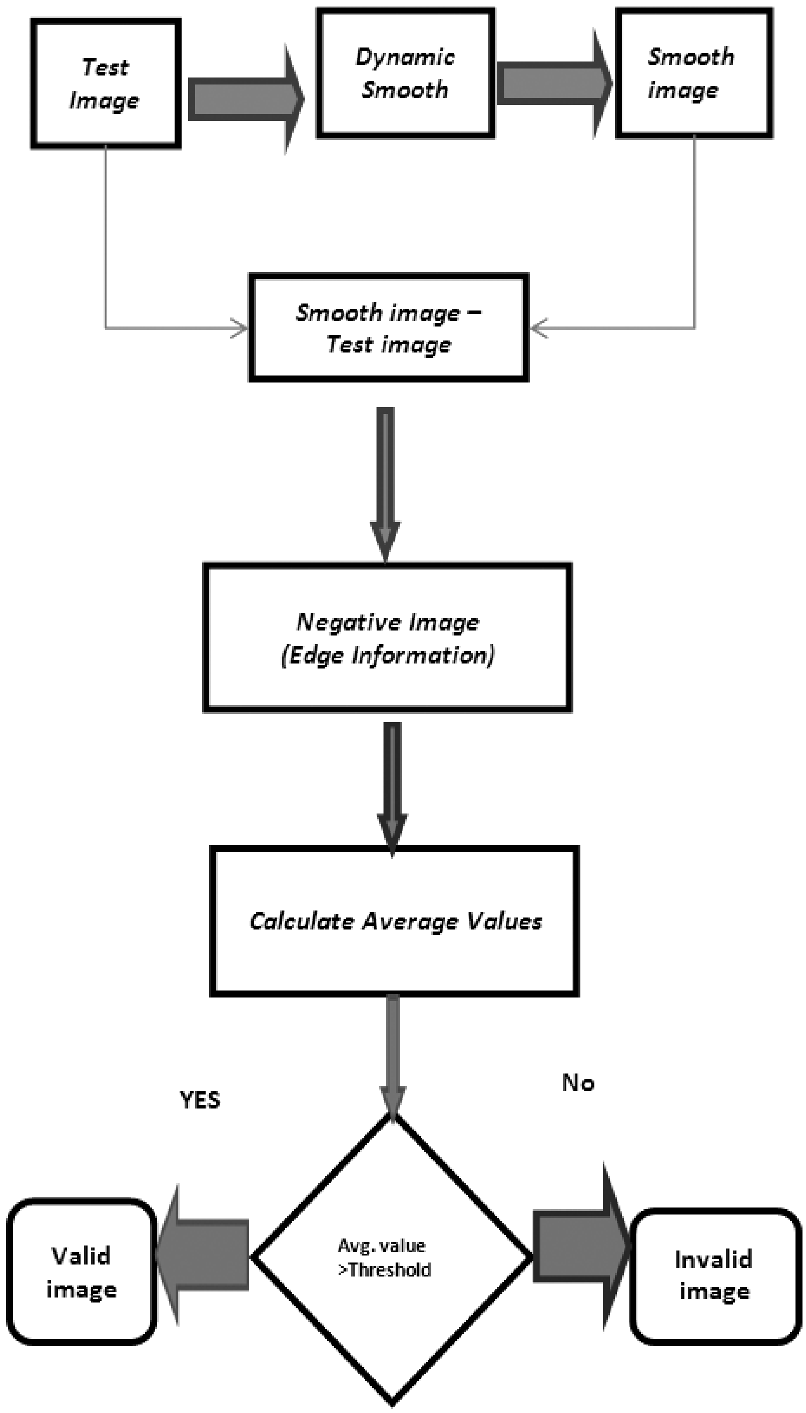


Figure 2: Focus/blurriness detection flowchart

Calculation of blur grade:

$$Grade = 10 - \frac{obtained\ value - min\ threshold}{max\ threshold - min\ threshold} \times 10$$

Where, *Obtained value* is the minimum value obtained by averaging pixels of the three channels in negative image

Max threshold value is 4.000000
Min threshold value is 1.000000

3.3. Detecting Specular reflected areas and eliminating those areas

As we said earlier specular reflections in facial images has a determinal effect on skin analysis. It is quite necessary to eliminate those areas in images before sending to face analysis or the analysis report will be wrong.

The average brightness of a region is defined as the *samplemean* of the pixel brightness's within that region. The average, m_a, of the brightness's over the Δ pixels within a region ($\mathfrak{R}$) is given by:

$$m_a = \frac{1}{\Lambda} \sum_{(m,n)\in\mathfrak{R}} a[m,n]$$

The average brightness, m_a, is an estimate of the mean brightness, u_a, of the underlying brightness probability distribution.

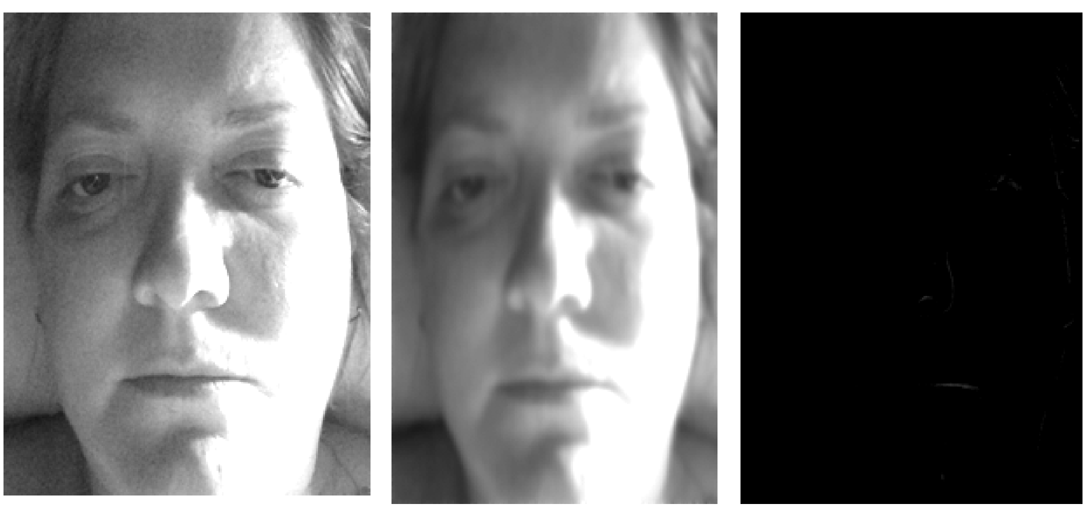
The *unbiasedestimate* of the standard deviation, s_a, of the brightness's within a region ($\mathfrak{R}$) with Λ pixels is called the *samplestandarddeviation* and is given by:

$$s_a = \sqrt{\frac{1}{-\Lambda} \sum_{m,n\in\mathfrak{R}} \left(a[m,n] - m_a\right)^2}$$

$$= \sqrt{\frac{\sum_{m,n\in\mathfrak{R}} a^2[m,n] - \Lambda m_a^2}{\Lambda - 1}}$$

The standard deviation, s_a, is an estimate of a of the underlying brightness probability distribution.

3.4. Focus Level Outputs



(a) (b) (c)

Figure 3: Comparisions (a) Crop image (b) Smooth image (c)negative output

3.5. Blur Grade Calculation

(a) (b) (c)

Figure 4: Comparisions (a) Blur Grade=0(b) Blur Grade=0(c) Blur Grade=0

APPLICATION

This Project work has a specific application for real time mobile environment for skin analysis.

CONCLUSION

This Project is measured the level of focus in image are uploaded to the BTBP mobile application for skin analysis and Rejected the Images Based on Blur Grade Calculation .Remove Specular Reflection in Shine Effected Images for Skin analysis.

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