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IMAGE BASED EXTRACTION OF FLUORESCENT COMPONENT IN COMPOSITE OBJECT

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Abstract: - In the field of computer vision, recognizing objects by their fluorescence and is always excluded even by various experts owing to its complexity. But in reality fluorescence is a very common phenomenon observed in many objects, from gems, corals and even in our clothes. Despite ordinary reflectance color appearance of a fluorescent object is unaffected by illumination. We have explained that the color appearance of objects with reflective and fluorescent components can be represented as a linear combination of the two components. This paper includes extraction of fluorescent and reflective components from the composite image and estimating its total area, extracted components area and percentage of area/image area. Additionally we have demonstrated this project with the study of identifying defective area extraction and particle extraction. LabVIEW software helps in the identification of defective area, separation of fluorescence, reflectance and particle extraction. The programming software helps in evaluating the area and number of pixels. This study helps in extracting fluorescence for outdoor images also which is a complex task in various previous studies on fluorescence. The effectiveness of the proposed paper is demonstrated under various illumination of light and separates the fluorescence from the reflectance in an image.

Keywords: Computer vision, fluorescence, reflectance components separation, fluorescence emission, diffuse reflection, illumination

I. Introduction

As appearance of objects varies dramatically with surrounding illumination, recognizing objects and patterns by their color has always been a complex problem. Fluorescence is a emission of visible light by objects that are exposed to a source light covering the ultraviolet range, (e.g., sunlight, UV light). Fluorescence surfaces are common and present in 20% of randomly constructed scenes. Repeated experimentation lead us to discover that a composite object with ordinary reflective and fluorescent components has the color appearance that is the sum of two components interacting with illumination differently. Most typical fluorescence material absorbs light in the near ultra violet (UV) range from 200nm to 380nm, and re-emit visible light in 380nm to 720 nm. Because of its complexity fluorescence can be excluded from color appearance. Algorithms in computer vision and image processing. In reality, fluorescence is a very common phenomenon observed in many objects, from germs and

corals, to different kinds of writing paper, and even in our clothes. Despite ordinary reflectance, appearance of fluorescence is unaffected by illumination in fluorescent objects. Researchers in computer vision have been excluding fluorescent objects from their considerations due to the complexity and lack of theoretical basics on fluorescence phenomenon. There is no correlation between the spatial distributions of reflective and fluorescent components. Moreover, many people describe the future with conduct experiments including settings that resemble the reality accurately, such as outdoors with natural light, and apply the results to fine-tune model. In this project, presence of fluorescent component in composite object makes complexity for analysis and reduced or changing the image quality therefore fluorescent can be separated by means of illumination of different color signal using digital image processing and computer vision is proposed. The horizontal, vertical and diagonal of fluorescent object can be easily detected using this technique. Some conditions such as bad illumination and non-uniform background in images may influence the accuracy of the images. This project also helps in developing outdoor images with high accuracy. So, a lot of work has been made to overcome these hardships and to provide well organized method for removal of fluorescence and its dimensions are provided in computer vision using LabVIEW software.

II .Related work

In everyday life, fluorescent materials are common they have received computer graphics attention. Especially, fluorescent materials have no bidirectional re radiation available so far. The concept of bidirectional reflectance distribution function (BRDF) to account for energy transfer between wavelengths, resulting in bispectral bidirectional reflectance and reradiation distribution function (bispectral BRRDF). The reflectance and reradiation data of different fluorescent materials, vehicle paints, paper and fabric. Are acquired by using bidirectional and bispectral measurement setup. Our acquisition is guided by a principal component analysis on complete bispectral data taken. For various color-based computer vision tasks camera spectral sensitivity plays an important role.

This project deals with application of signal processing and chemo metric techniques of fluorescence spectroscopy. Recorded spectra of pure components in this field are characterized by very large peaks and come from a combination of pure elements. It is difficult to reconstruct the pure components spectra because of they are statistically dependence. We have decided to analyse existing techniques to resolve this problem.

The vision of our human eye is capable of producing the original images with colors accurately. This ability is called as color constancy. While viewing the colored images illuminance varies which is an important factor for color constancy. Color constancy is very important for digital photography and automatic color-based object recognition. In digital photography, this ability is known under the name automatic white balance. In this paper two well-known color constancy algorithms, the gray world assumption and the Retinex algorithm and show how a color constancy algorithm may be integrated into the JPEG2000 frame work. Computer always store images in compressed form so little overhead is required to add color constancy into the processing pipeline.

III .LabVIEW Introduction

LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a graphical programming language used as a powerful and flexible instrumentation and analysis software system in industry and academic. LabVIEW uses a graphical programming language to create programs called Virtual Instrument or VI in a pictorial form called a block diagram,   eliminating a lot of the syntactical details of other programming languages like C and MATLAB that uses a text based programming approach. LabVIEW also includes many tools for data acquisition, analysis and display of results. The analysis library contains a multitude of functions in signal generation, signal processing, filtering and statistics. LabVIEW is available for all the major platforms and is easily portable across platforms.

Features of LabVIEW

Some of the features if LabVIEW is as follows: Interfacing, Code compilation, Large libraries.

Interfacing

A key of LabVIEW over other development environments is the extensive support for accessing instrumentation hardware. Drivers and abstraction layers for many different types of instruments and buses are included or are available for inclusion. These present themselves as graphical nodes. The abstraction layers offer standard software interfaces to communicate with hardware devices.

IV Proposed system
Front panel

The one of the two important parameters of the LabVIEW is front panel. This is used to give inputs by the user and to obtain the results and display it for the user. It consists of many controls and indicators that provide input and output respectively.

The front panel of this extraction process consists of a input image column that is used to provide the image to be processed and to display the extracted image or output image. It has the output and extracted image column to display the processed image. Then it consists of controls such as particle extraction, fluorescent component, reflective component and defective area extraction that are controlled by the user. It consists an string of array table that is used to identify the location, file path and name of the image and is known as Image File Path. Image file path is the most significant part of the extraction process. If the path is entered wrong then the process may not be successful. It also consists of the three columns which displays the total area, extracted image area and percentage of both the areas.
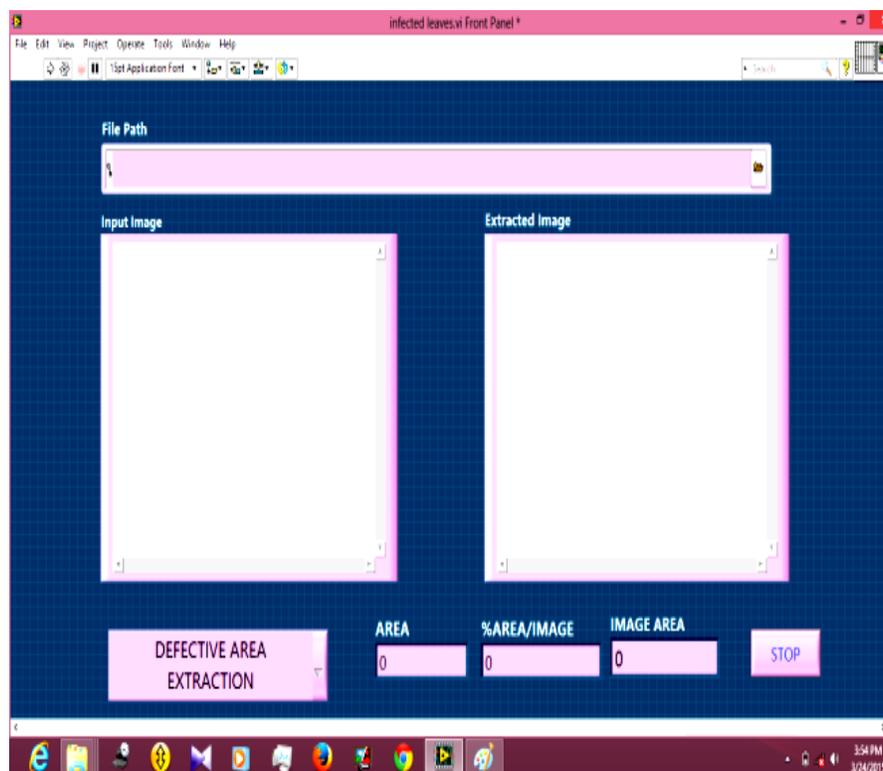

Fig.1.Front panel of the proposed system
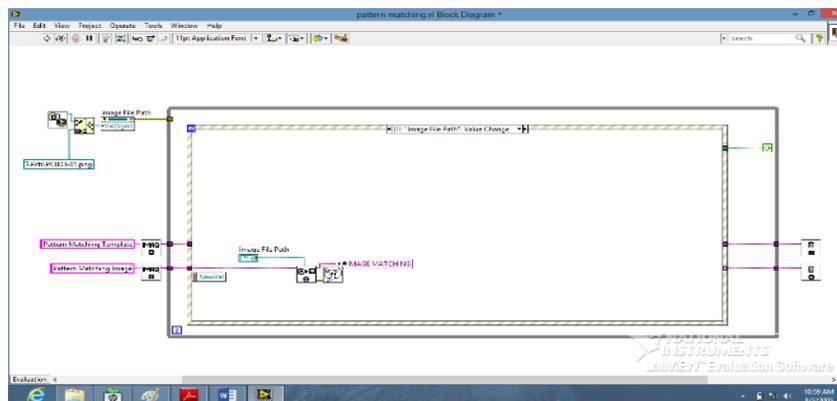
Block diagram

1.Image File Path

Fig.2.Block diagram of image acquisition

The first step is to obtain the file path of the images for which the extraction has to be done. The base image and the folder in which the images are present are appended using the BUILD PATH function.

When the process starts executing the extraction image is obtained by using the IMAGE READ function which obtains the folder of the image from image file path and stored as string of image name.

2. Particle extraction

The histogram is the function H defined on the grayscale range [0, . . ., k, . . ., 255] such that the number of pixels equal to the gray-level value k is

$$H(K) = n_k$$

Where
K is the gray-level value,
nk is the number of pixels in an image with a gray-level value equal to k, and
$\sum n_k$ from k = 0 to 255 is the total number of pixels in an image.
Two types of histograms can be calculated:
    1. Linear histograms
    2. Cumulative histograms
In both cases, the horizontal axis represents the gray-level value that ranges from 0 to 255. For a gray-level value k, the vertical axis of the linear histogram indicates the number of pixels n_k set to the value k, and the vertical axis of the cumulative histogram indicates the percentage of pixels set to a value less than or equal to k.

- **LINEAR HISTOGRAM:**
The density function is
$$H_{Linear}(k) = n_k \tag{1}$$

Where
$H_{Linear}(k)$ is the number of pixels equal to k.
The probability function is
$$P_{Linear}(k) = n_k /n \tag{2}$$
Where
PLinear(k) is the probability that a pixel is equal to k.

- **CUMULATIVE HISTOGRAM:**

The distribution function is

$$H_{Cumul}(k) = \sum_{i=0}^{k} n_i \tag{3}$$

Where

$H_{Cumul}(k)$ is the number of pixels that are less than or equal to k.

The probability function is

$$P_{Cumul}(k) = \sum_{i=0}^{k} n_i/n \tag{4}$$

Where

$P_{Cumul}(k)$ is the probability that a pixel is less than or equal to k.

FEATURE EXTRACTION

The binary operator gradient out and proper close was then used to extract and enhance edges of the images. Histogram method is used for the extraction of the component.

Fig.3.Algorithm developed(fluorescence)

Fig.4.Algorithm developed (reflectance)

Particle extraction

For the particle analysis the image acquisition is same as fluorescence and the IMAQ Color BCG operator extract the dark objects by providing brightness more, less contrast and gamma as more. o by this dark images are viewed. The value plane selected in IMAQ Extract single color plane. In IMAQ Gray morphology, gray morphological function proper close is provided shown in the equation given above. Threshold eliminates unwanted noise. Particle analysis is as same as fluorescence programming. IMAQ Gray Morphological operator can also have IMAQ Fill Hole that fill the small holes in image. Error out and its output is taken as like fluorescence.
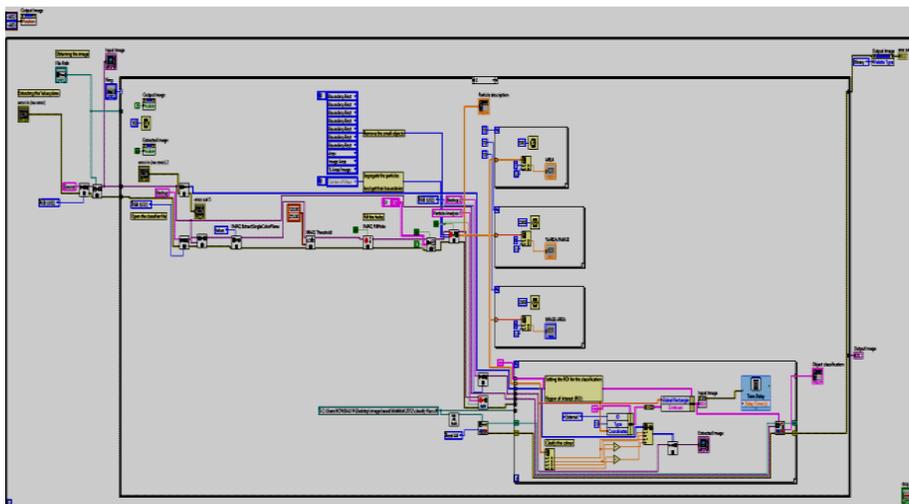

Fig.5. Block diagram for particle extraction

V. Result and discussion:

Fluorescent component extraction:

The output shown in the image which can only display the fluorescent component. The fluorescent component can be extracted from the input image displayed in the front panel. The input image is given to the file path and that image is being processed. The case selector which is used to select fluorescence program to execute and the output is displayed. In addition to that it displays also the total image area, extracted fluorescent image area and % of total image area/extracted fluorescent image. When the user wants to stop the execution manually then the exit button is pressed in the front panel.
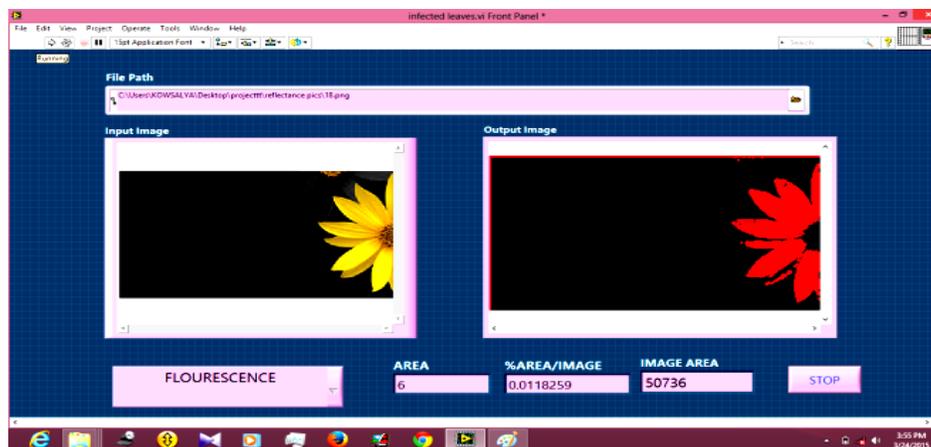

Fig no.6.Front Panel (Fluorescent component Extraction)

Reflective component extraction:

The output shown in the image which can only display the extracted reflective component. The reflectance can be extracted from the input image displayed in the front panel. The input image is given to the file path and that image is being processed. The case selector which is used to select reflectance program to execute and the output is displayed. In addition to that it displays also the total image area, extracted reflective component area and % of total image area/extracted reflective component image. When the user wants to stop the execution manually then the exit button is pressed in the front panel.
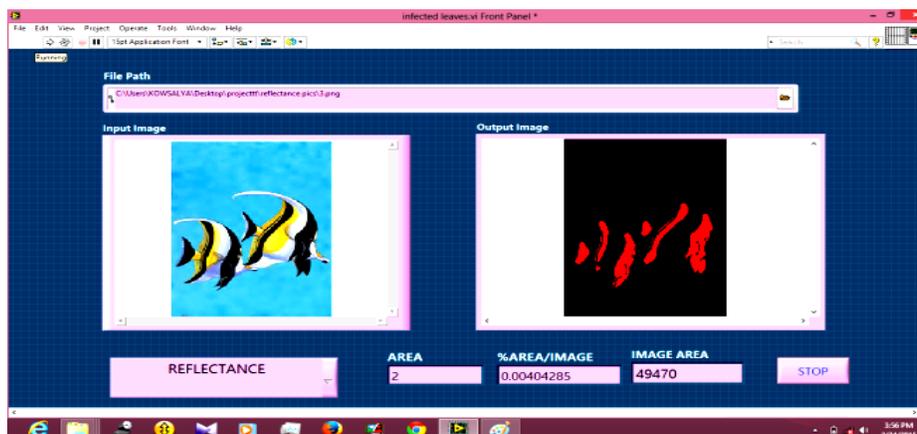

Fig.6. Front panel (Reflective component extraction)

Defective area extraction:

The output shown in the image which displays the defective portion of leaves from the input image. The input image is given to the file path and that image is being processed. The case selector which is used to select defective area extraction coding and output is displayed. In addition to that it displays also the total area of the leaf, defective portion's area and % of total area/defective area. When the user wants to stop the execution manually then the exit button is pressed in the front panel.
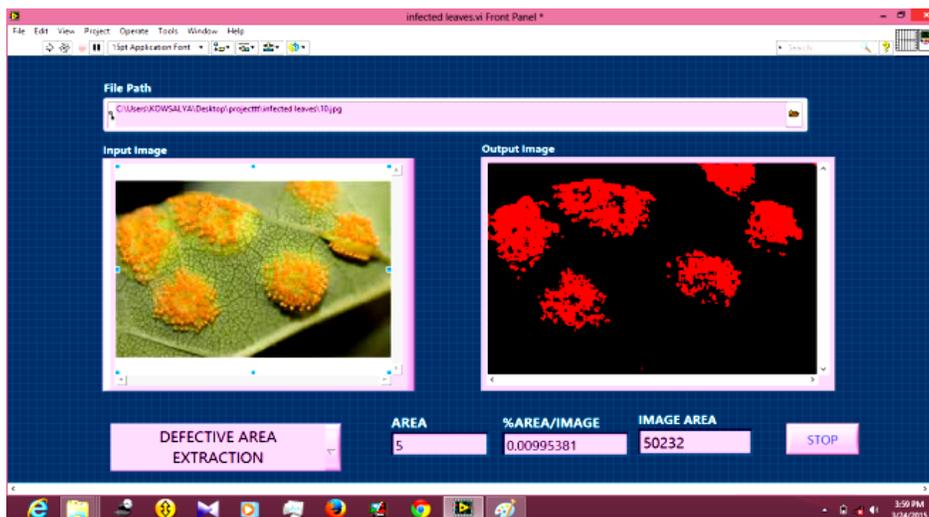

Fig.7. Front panel (defective area extraction)

Particle extraction:

The output shown in the image which displays the particle extracted from the input image in the front panel. The particle extraction process has been selected from the case selector button which is available in the front panel. The input image is given to the file path and that image is being processed. The particular is extracted using the ROI. ROI is used to focus, processing and analysis on part of an image. You can define an ROI using standard contours, such as an oval or rectangle, or freehand contours. The extracted image has the fluorescent component being extracted separately and displayed. In addition to that it also displays the total area of the image, extracted image area and % of total area/extracted image area. When the user wants to stop the process manually then the exit button is pressed.
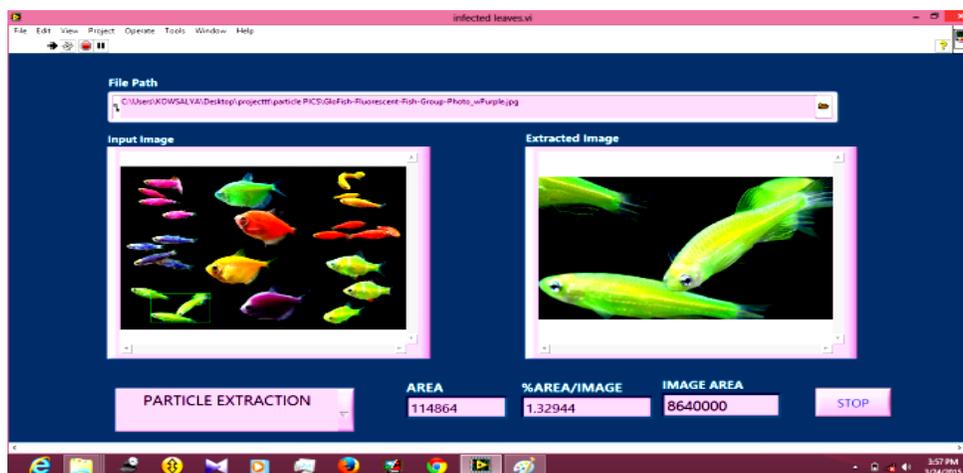

Fig.8.Front panel (Particle extraction)

Conclusion:

This project provided theories of fluorescence phenomenon and explained the difference in appearance between fluorescence and reflectance. Here the fluorescent and reflective components of objects are separated using images captured under various sources and processed using LabVIEW. The results showed that our method is robust and effective under a variety of situations. Traditionally, researchers in computer vision have been excluding fluorescent objects from their consideration due to the complexity and lack of theoretical basis on fluorescence phenomenon. This separation method provides additional information to improving existing computer vision algorithms that consider object appearance and extraction of fluorescent and reflective components from the composite image and estimating its total area, extracted components area and percentage of area/extracted image area. In near future, fluorescent can be applied for analysis of cell structure, function and health by using flow and imaging cytometry. It can also be applied in new instrumentation for sensitive image analysis of fluorescence in cell and tissues. This study will be effective in video connected fluorescence microscopy of large DNA molecules, chromatin and chromosomes and also in standing wave fluorescence microscopy. To detect changes in chromosome number or structure associated with genetic disease.

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