Programming Techniques

Tutorials and Mini Projects of C, C++, PHP, OpenGL, and other languages with C/C++ codes of Data Structure, Numerical Methods and Computer Graphics

Thursday, January 10, 2013

Intensity Histogram using C++ and OpenCV: Image Processing

Theory

The histogram of a digital image with gray levels in the range [0, L-1] is a discrete function $h(r_k) = n_k$, where r_k is the kth gray level and n_k is the number of pixels in the image having gray level r_k.

For an 8-bit grayscale image there are 256 different possible intensities, and so the histogram will graphically display 256 numbers showing the distribution of pixels among those grayscale values.

Algorithm

1. Assign zero values to all element of the array h_f;
2. For all pixel (x, y) of the image f, increment $h_f[f(x, y)]$ by 1.

Source Code

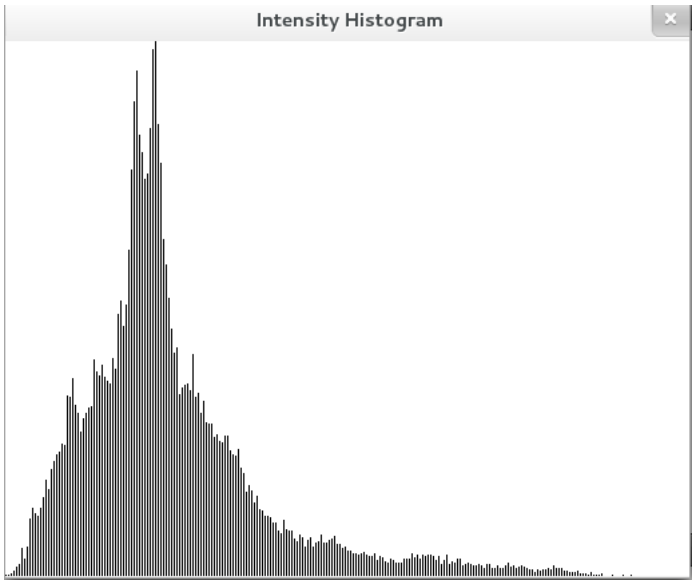
```
#include<iostream>
#include<opencv2/highgui/highgui.hpp>
#include<opencv2/imgproc/imgproc.hpp>

using namespace std;
using namespace cv;

int main()
{
    Mat image = imread("picture.jpg", CV_LOAD_IMAGE_GRAYSCALE);

    // allcoate memory for no of pixels for each intensity value
    int histogram[256];

    // initialize all intensity values to 0
    for(int i = 0; i < 255; i++)
    {
        histogram[i] = 0;
    }

    // calculate the no of pixels for each intensity values
    for(int y = 0; y < image.rows; y++)
        for(int x = 0; x < image.cols; x++)
            histogram[(int)image.at<uchar>(y,x)]++;

    for(int i = 0; i < 256; i++)
        cout<<histogram[i]<<" ";

    // draw the histograms
    int hist_w = 512; int hist_h = 400;
    int bin_w = cvRound((double) hist_w/256);

    Mat histImage(hist_h, hist_w, CV_8UC1, Scalar(255, 255, 255));

    // find the maximum intensity element from histogram
    int max = histogram[0];
    for(int i = 1; i < 256; i++){
        if(max < histogram[i]){
            max = histogram[i];
        }
    }
```

```
43      // normalize the histogram between 0 and histImage.rows
44
45      for(int i = 0; i < 255; i++){
46          histogram[i] = ((double)histogram[i]/max)*histImage.rows;
47      }
48
49
50      // draw the intensity line for histogram
51      for(int i = 0; i < 255; i++)
52      {
53          line(histImage, Point(bin_w*(i), hist_h),
54                                Point(bin_w*(i), hist_h - histogram[i]),
55               Scalar(0,0,0), 1, 8, 0);
56      }
57
58      // display histogram
59      namedWindow("Intensity Histogram", CV_WINDOW_AUTOSIZE);
60      imshow("Intensity Histogram", histImage);
61
62      namedWindow("Image", CV_WINDOW_AUTOSIZE);
63      imshow("Image", image);
64      waitKey();
65      return 0;
66  }
```

Output

Input Image

Output Histogram



About Author

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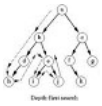

Depth First Search in Algorithm and Source

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Matrix is the perfect e two dimensional array and column. Row repr dimension and column represents sec

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Bibek Subedi is a computer engineering gratuate and founder of Programing Techniques. He loves researching in the field of Machine learning, data mining and Algorithms. He is a part time blogger, a bathroom singer (:D) and an employee of a software company. You can follow him in Twitter and find him in Facebook or mail him

6 comments:

mrter2000 December 27, 2013 at 9:32 PM

1>main.cpp(46): warning C4244: '=' : conversion from 'double' to 'int', possible loss of data

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Replies

Anonymous May 23, 2015 at 1:49 AM

histogram[i] = floor(((double)histogram[i]/max)*histImage.rows);

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Manoj Kumar March 7, 2016 at 6:05 PM

How to plot continuous histogram? Here,this code generates discrete one.

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saad April 4, 2016 at 2:46 PM

nice code bro

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Anonymous April 27, 2016 at 1:53 PM

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Unknown October 1, 2016 at 1:47 PM

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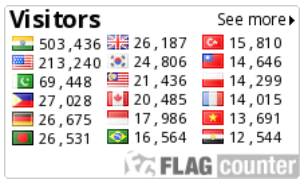

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