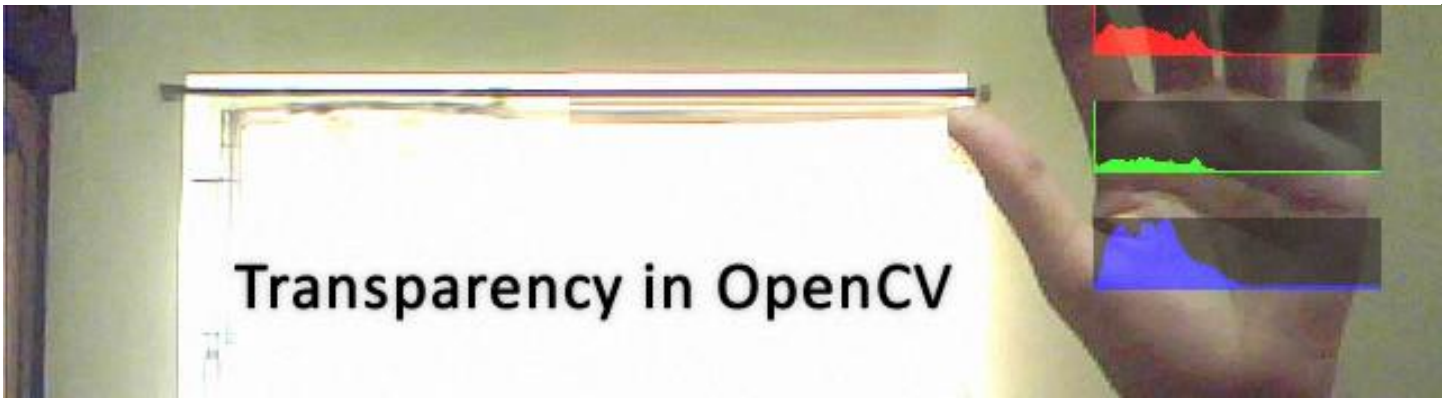


Transparent image overlays in OpenCV

By Utkarsh | Published: July 7, 2010

Time for some fun! Today we'll be creating an interesting program today. I'll be referring to a few old posts I've done. The the final result will be you'll see histograms of R, G and B on top of a live video feed. And they will be semi transparent. Okay, so lets get started with this!

Prerequisites

For now, I'll assume you've read these posts:

- **Drawing Histograms in OpenCV**
  Here I go through a flexible function that will draw a histogram from any grayscale image you give it
- **Some method of capturing live video**
  I've discussed two ways here: one uses OpenCV's cvcam libraries and the other uses DirectX to capture images using videoInput.

The main function

Lets get to the code now. Create a new project. First, add the standard OpenCV headers and the videoInput headers:

```
#include <cv.h>
#include <highgui.h>

#include "videoInput.h"
```

Then, the main function:

```
void main()
{
```

I'll use the videoInput method. It works on my computer. The functions of the internal libraries of OpenCV don't work with my webcam for some reason (know why? let me know please).

```
    videoInput VI;
    int numDevices = VI.listDevices();
    int device1= 0;

    // Setup the capture
    VI.setupDevice(device1);
    int width = VI.getWidth(device1);
    int height = VI.getHeight(device1);
```

Then, we create an image that will hold the webcam's live feed:

```
    IplImage* img= cvCreateImage(cvSize(width, height), 8, 3);
    unsigned char* yourBuffer = new unsigned char[VI.getSize(device1)];
```

img will hold the image in OpenCV's format. yourBuffer holds the image in videoInput format (raw bytes). We'll be creating live histograms for the image, so we initialize a histogram structure.

```
    // Variables to be used for the histgoram
    int numBins = 256;
    float range[] = {0, 255};
    float *ranges[] = { range };

    // Initialize a histogram
    CvHistogram *hist = cvCreateHist(1, &numBins, CV_HIST_ARRAY, ranges, 1);
    cvClearHist(hist);
```

We're creating a histogram with 256 bins, it is uniform and is one dimensional.

Next, we create a handy black image. You'll see why this is needed in a minute:

```
    IplImage* imgBlack = cvCreateImage(cvSize(128, 32), 8, 1);
    cvZero(imgBlack);
```

Then we create some temporary images we'll be needing:

```
    IplImage* imgRed = cvCreateImage(cvGetSize(img), 8, 1);
    IplImage* imgGreen = cvCreateImage(cvGetSize(img), 8, 1);
    IplImage* imgBlue = cvCreateImage(cvGetSize(img), 8, 1);

    IplImage* imgRedHist = cvCreateImage(cvSize(128, 32), 8, 3);
    IplImage* imgGreenHist = cvCreateImage(cvSize(128, 32), 8, 3);
    IplImage* imgBlueHist = cvCreateImage(cvSize(128, 32), 8, 3);
```

The first three images will hold the red, green and blue of the captured frame. The next three images will hold the histograms.

Now we get into the loop. This loop constantly grabs new frames from your camera:

```
    while(1)
    {
```

```
VI.getPixels(device1, yourBuffer, false, false);
img->imageData = (char*)yourBuffer;
cvConvertImage(img, img, CV_CVTIMG_FLIP);
```

The first line actually grabs the raw bytes. The second line associates these bytes with the OpenCV structure. Finally, we flip the image (because the image captured is upside down).

We split the image into constituent channels next:

```
cvSplit(img, imgBlue, imgGreen, imgRed, NULL);
```

Then, as in the Drawing Histograms in OpenCV post, we draw histograms for each channel:

```
cvCalcHist(&imgRed, hist, 0, 0);              // Calculate the histogram for red
IplImage* imgHistRedOnly = DrawHistogram(hist, 0.5, 0.5);    // Draw it
cvClearHist(hist);                            // Clear the histgoram

cvCalcHist(&imgGreen, hist, 0, 0);            // Reuse it to calculate histogram for
IplImage* imgHistGreenOnly = DrawHistogram(hist, 0.5, 0.5);
cvClearHist(hist);

cvCalcHist(&imgBlue, hist, 0, 0);            // And again for blue
IplImage* imgHistBlueOnly = DrawHistogram(hist, 0.5, 0.5);
cvClearHist(hist);
```

Next, we zero out the previous frame's histogram:

```
cvZero(imgRedHist);
cvZero(imgGreenHist);
cvZero(imgBlueHist);
```

Then, we merge the current histogram image into a 3 channel image. The DrawHistogram returns a single channel image. But because we want to overlay it onto a 3 channel image, we need to convert it into a 3 channel image:

```
cvMerge(imgHistBlueOnly, imgBlack, imgBlack, NULL, imgBlueHist);
cvMerge(imgBlack, imgHistGreenOnly, imgBlack, NULL, imgGreenHist);
cvMerge(imgBlack, imgBlack, imgHistRedOnly, NULL, imgRedHist);
```

This is where the imgBlack images are useful. We use the histogram image (the one we got from DrawHistogram), put it into the appropriate channel and set the other channels to zero.

Finally, we overlay the images with transparency:

```
OverlayImage(img, imgRedHist, cvPoint(485, 24), cvScalar(0.5,0.5,0.5,0.5), cvScalar(0
OverlayImage(img, imgGreenHist, cvPoint(485, 76), cvScalar(0.5,0.5,0.5,0.5), cvScalar
OverlayImage(img, imgBlueHist, cvPoint(485, 128), cvScalar(0.5,0.5,0.5,0.5), cvScalar
```

We'll get to this function in sometime. Those super long parameters actually mean something. And you'll know what they mean when we get to it.

And finally, we display the image:

```
cvShowImage("Overlay", img);
```

Then, we wait for the user to press escape. If he does, we quit. Otherwise, the loop continues. Thus the main function ends.

```
        if(cvWaitKey(15)==27) break;
    }
}
```

Drawing histograms

Here's the function to draw histograms. Just in case:

```
// A function to draw the histogram
IplImage* DrawHistogram(CvHistogram *hist, float scaleX=1, float scaleY=1)
{
    // Find the maximum value of the histogram to scale
    // other values accordingly
    float histMax = 0;
    cvGetMinMaxHistValue(hist, 0, &histMax, 0, 0);

    // Create a new blank image based on scaleX and scaleY
    IplImage* imgHist = cvCreateImage(cvSize(256*scaleX, 64*scaleY), 8 ,1);
    cvZero(imgHist);

    // Go through each bin
    for(int i=0;i<255;i++)
    {
        float histValue = cvQueryHistValue_1D(hist, i);        // Get value for the current b
        float nextValue = cvQueryHistValue_1D(hist, i+1);    // ... and the next bin

        // Calculate the four points of the polygon that these two
        // bins enclose
        CvPoint pt1 = cvPoint(i*scaleX, 64*scaleY);
        CvPoint pt2 = cvPoint(i*scaleX+scaleX, 64*scaleY);
        CvPoint pt3 = cvPoint(i*scaleX+scaleX, (64-nextValue*64/histMax)*scaleY);
        CvPoint pt4 = cvPoint(i*scaleX, (64-histValue*64/histMax)*scaleY);

        // A close convex polygon
        int numPts = 5;
        CvPoint pts[] = {pt1, pt2, pt3, pt4, pt1};

        // Draw it to the image
        cvFillConvexPoly(imgHist, pts, numPts, cvScalar(255));
    }

    // Return it... make sure you delete it once you're done!
    return imgHist;
}
```

I've gone through this function in detail in the Drawing Histograms in OpenCV post.

Creating Overlays

Now we get to the OverlayImage function. Start by creating the first line:

```
void OverlayImage(IplImage* src, IplImage* overlay, CvPoint location, CvScalar S, CvScalar D)
```

```
{
```

This function takes the source image (*src*) and puts the image *overlay* on top of it. location is the position where the image must be put. *S* and *D* are blending coefficients.

When overlaying, you're obviously replacing pixel values by other values. These values are computed by multiplying S and the RGB values at the source and adding to D*RGB Values in the overlay image.

To do this, we must iterate over the entire image to be overlaid:

```
    for(int x=0;xwidth;x++)
    {
        if(x+location.x>=src->width) continue;
        for(int y=0;yheight;y++)
        {
            if(y+location.y>=src->height) continue;
```

The if statements keep the loops from going beyond the source image. Then, we get the pixel value at (x,y) in both *src* and *overlay*.

```
            CvScalar source = cvGet2D(src, y+location.y, x+location.x);
            CvScalar over = cvGet2D(overlay, y, x);
```

And we calculate the new "merged" pixel value:

```
            CvScalar merged;
            for(int i=0;i<4;i++)
                merged.val[i] = (S.val[i]*source.val[i]+D.val[i]*over.val[i]);
```

We set this as the next pixel value and that ends the function!

```
            cvSet2D(src, y+location.y, x+location.x, merged);
        }
    }
}
```

Because *src* is a pointer, any changes made in the image will automatically be reflected in the main function. So we don't need to return anything.

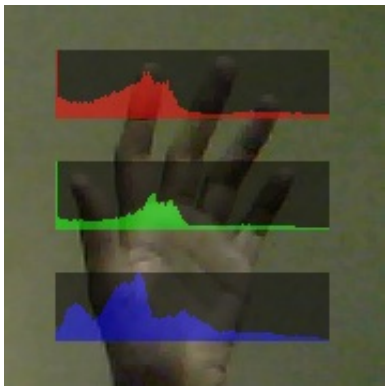
Done!

After linking the appropriate library files (Project Properties -> Configuration Properties -> Linker -> Input) for OpenCV and videoInput, the program should compile. On running you'll see live video and a histogram on the right.

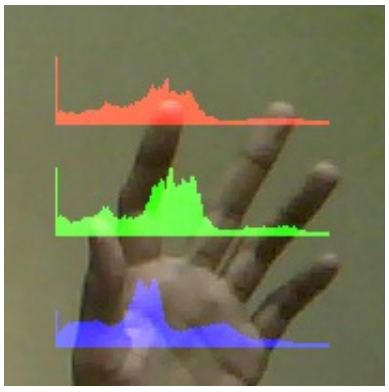
Note: I assume that your webcam/camera will work at 640×480. If it doesn't make sure you change the location parameter (I use cvPoint(485, 20), etc in this post).

Play around with S and D

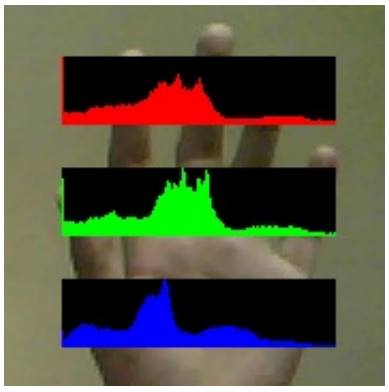
Different sets of S and D produce different results. Here are a few that results that I got:



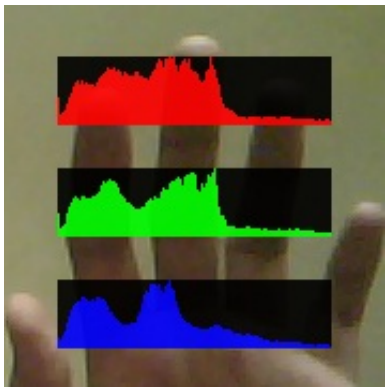
Standard 50% transparencyS = (0.5, 0.5, 0.5, 0.5)
D = (0.5, 0.5, 0.5, 0.5)



Black turns see throughS = (1,1,1,1)
D = (1,1,1,1)



No transparency. Simple copy pasteS = (0,0,0,0)
D = (1,1,1,1)



10% transparentS = (0.1, 0.1, 0.1, 0.1)
D = (0.9, 0.9, 0.9, 0.9)

90% transparentS = (0.9, 0.9, 0.9, 0.9)
D = (0.1, 0.1, 0.1, 0.1)

Do you see a pattern? If you want x% transparency, you set S to x and D to 1-x.

And try negative values too Did you get some interesting results? Or do you have some questions/suggestions? **Leave a comment**!

Issues? Suggestions? Visit the Github issue tracker for AI Shack

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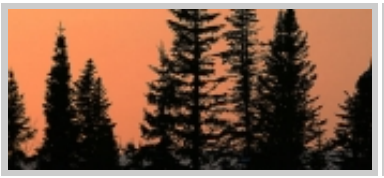
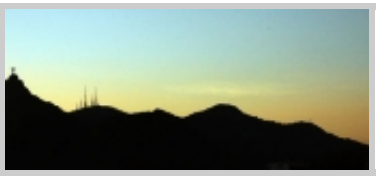
Drawing Histograms in OpenCV



Histograms with inbuilt functions of OpenCV



Accessing Histogram Data

9 Comments

Ali
Posted October 13, 2010 at 9:27 am | *Permalink*

I get the follwoing error:
LINK : fatal error LNK1104: cannot open file ‘atlthunk.lib’
Plz, could you help me

Reply

Utkarsh
Posted October 14, 2010 at 8:11 pm | *Permalink*

atlthunk.lib isn't actually used. Take any file and rename it to 'atlthunk.lib'. Place it in the libraries directory. Your program should compile!

Reply

amit
Posted October 27, 2010 at 11:51 pm | *Permalink*

Hi Utkarsh..this is Amit from IIT Guwahati. First of all,thanks a lot for such a nice article,it helped me a lot. Can you tell me; how i could work in opencv for transparency feature in image; i mean;how can i make a particular pixels lets say (i,j) transparent.

Reply

Utkarsh
Posted October 31, 2010 at 3:25 am | *Permalink*

Hi Amit! OpenCV doesn't support "transparency" directly. I mean, you can have a grayscale image/channel representing the opacity of each pixel. But you'd have to write your own code to blend multiple pixels due to transparency.

Reply

muelleth
Posted December 9, 2010 at 8:17 pm | *Permalink*

How about:

```
/* dst = src1 * alpha + src2 * beta + gamma */
CVAPI(void)  cvAddWeighted( const CvArr* src1, double alpha,
                            const CvArr* src2, double beta,
                            double gamma, CvArr* dst );
```

Reply

Utkarsh
Posted December 9, 2010 at 9:03 pm | *Permalink*

Yup! That would work too!

Reply

Vinay M K

Posted March 23, 2011 at 7:41 am | *Permalink*

I think OverlayImage function by Utkarsh is still useful since the cvAddWeighted doesnot have location parameter. Especially when overlay image is much smaller compared to source image.

Reply

Olu

Posted July 4, 2011 at 9:20 pm | *Permalink*

Hi,
Why do you need 4 S values and 4 D values?

Reply

Utkarsh

Posted August 9, 2011 at 6:40 pm | *Permalink*

They're used to describe how the source and destination colors are blended together. If S = (1,1,1,1) and D = (0,0,0,0) you're just taking the source image. If D = (1,1,1,1) and S = (0,0,0,0) then you're taking only the destination image. Makes sense?

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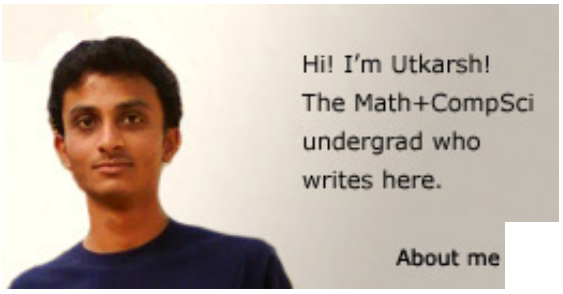

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About me

My name is Utkarsh Sinha, and I'm an undergraduate student, pursuing B.E. Computer Science + M.Sc. Mathematics. Here, I help you understand ideas in Artificial Intelligence, using a not so techy and mathematical language. And in the process, learn more about Artificial Intelligence myself.

Read more at the about page