Computer and Robot Vision

Homework#10

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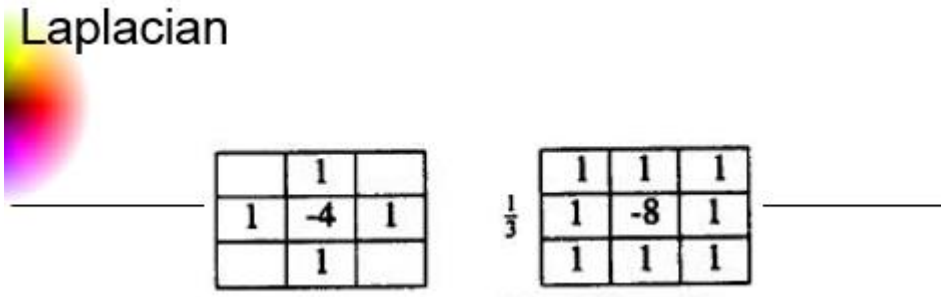
這次的作業是對原圖做 Zero Crossing Edge Detection。
我使用 VS2012 編寫程式

(a) Laplace Mask




```
void Laplace1(const Mat src, Mat res, int threshold)
{
    //kernal
    float m[]={0,1,0,
               1,-4,1,
               0,1,0 };
    Mat M=Mat(3,3,CV_32F,m).clone();
    Kernel Mask(3, 3, 1, 1, M);

    float ZeroCross;
    for (int sI = 0; sI <= src.rows-1; sI++)
    {
        for (int sJ = 0; sJ <= src.cols-1; sJ++)
```

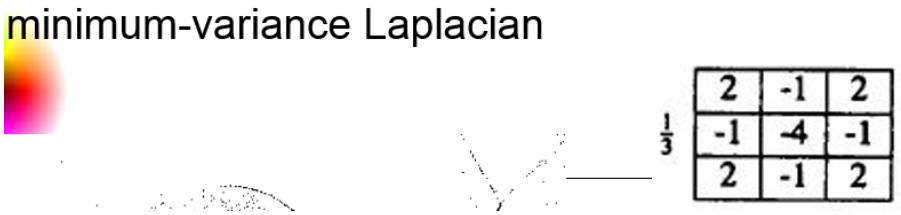
```
        {
            ZeroCross=ZeroCrossPixel(src, Mask, sI, sJ);
            if(ZeroCross>=threshold)
                res.at<uchar>(sI,sJ)=0;
            else
                res.at<uchar>(sI,sJ)=255;
        }
    }
}

void Laplace2(const Mat src, Mat res, int threshold)
{
    //kernal
    float m[]={1,1,1,
               1,-8,1,
               1,1,1 };
    Mat M=Mat(3,3,CV_32F,m).clone();
    Kernel Mask(3, 3, 1, 1, M);

    float ZeroCross;
    for (int sI = 0; sI <= src.rows-1; sI++)
    {
        for (int sJ = 0; sJ <= src.cols-1; sJ++)
        {
            ZeroCross=ZeroCrossPixel(src, Mask, sI, sJ);
            if( (ZeroCross/3.0) >= threshold )
                res.at<uchar>(sI,sJ)=0;
            else
                res.at<uchar>(sI,sJ)=255;
        }
    }
}
```

Threshold 取 15 的處理結果：

(b) Minimum variance Laplacian



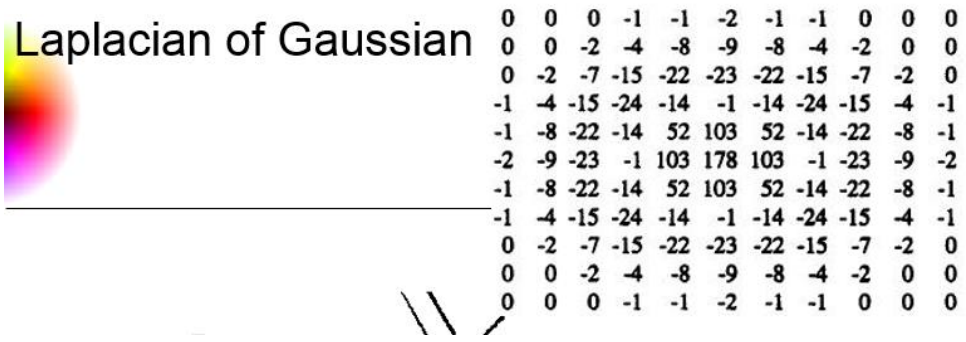

```
void MvLaplace(const Mat src, Mat res, int threshold)
{
    //kernal
    float m[]={2,-1,2,
               -1,-4,-1,
               2,-1,2 };
    Mat M=Mat(3,3,CV_32F,m).clone();
    Kernel Mask(3, 3, 1, 1, M);

    float ZeroCross;
    for (int sI = 0; sI <= src.rows-1; sI++)
    {
        for (int sJ = 0; sJ <= src.cols-1; sJ++)
        {
            ZeroCross=ZeroCrossPixel(src, Mask, sI, sJ);
            if( (ZeroCross/3.0) >= threshold )
                res.at<uchar>(sI,sJ)=0;
            else
```

```
                res.at<uchar>(sI,sJ)=255;
            }
        }
}
```

Threshold 取 20 的處理結果：

(c) Laplace of Gaussian




```
void LaplaceGaussian(const Mat src, Mat res, int threshold)
{
    //kernal
    float m[]={0,  0,  0,  -1, -1, -2, -1, -1, 0,  0,  0,
               0,  0,  -2, -4, -8, -9, -8, -4, -2, 0,  0,
               0,  -2, -7, -15,-22,-23,-22,-15,-7, -2, 0,
               -1, -4, -15,-24,-14,-1, -14,-24,-15,-4,-1,
               -1, -8, -22,-14,52, 103,52, -14,-22,-8,-1,
               -2, -9, -23,-1, 103,178,103,-1, -23,-9,-2,
```

```
                -1, -8, -22,-14,52, 103,52, -14,-22,-8,-1,
                -1, -4, -15,-24,-14,-1, -14,-24,-15,-4,-1,
                0,  -2, -7, -15,-22,-23,-22,-15,-7, -2, 0,
                0,  0,  -2, -4, -8, -9, -8, -4, -2, 0,  0,
                0,  0,  0,  -1, -1, -2, -1, -1, 0,  0,  0 };
    Mat M=Mat(11,11,CV_32F,m).clone();
    Kernel Mask(11, 11, 5, 5, M);

    float ZeroCross;
    for (int sI = 0; sI <= src.rows-1; sI++)
    {
        for (int sJ = 0; sJ <= src.cols-1; sJ++)
        {
            ZeroCross=ZeroCrossPixel(src, Mask, sI, sJ);
            if( ZeroCross >= threshold )
                res.at<uchar>(sI,sJ)=0;
            else
                res.at<uchar>(sI,sJ)=255;
        }
    }
}
```

Threshold 取 3000 的處理結果：

(d) Difference of Gaussian

Difference of Gaussian(inhibitory sigma=1, excitatory sigma=3, kernel size 11x11 [1][1])

```
-1  -3  -4  -6  -7  -8  -7  -6  -4  -3 -1
-3  -5  -8 -11 -13 -13 -13 -11  -8  -5 -3
-4  -8 -12 -16 -17 -17 -17 -16 -12  -8 -4
-6 -11 -16 -16   0  15   0 -16 -16 -11 -6
-7 -13 -17   0  85 160  85   0 -17 -13 -7
-8 -13 -17  15 160 283 160  15 -17 -13 -8
-7 -13 -17   0  85 160  85   0 -17 -13 -7
-6 -11 -16 -16   0  15   0 -16 -16 -11 -6
-4  -8 -12 -16 -17 -17 -17 -16 -12  -8 -4
-3  -5  -8 -11 -13 -13 -13 -11  -8  -5 -3
-1  -3  -4  -6  -7  -8  -7  -6  -4  -3 -1
```

```
void DifferenceGaussian(const Mat src, Mat res, int
threshold)
{
    //kernal
    float m[]={-1,  -3,  -4,  -6, -7,  -8,  -7,  -6,  -4,  -
3, -1,
              -3,  -5,  -8, -11, -13, -13, -13, -11,  -8, -
5, -3,
              -4,  -8, -12, -16, -17, -17, -17, -16, -12, -
8, -4,
              -6, -11, -16, -16,   0,  15,   0, -16, -16,-
11, -6,
              -7, -13, -17,  0,   85, 160,  85,   0, -17,-
13, -7,
              -8, -13, -17,  15, 160, 283, 160,  15, -17,-
13, -8,
              -7, -13, -17,  0,   85, 160,  85,   0, -17,-
13, -7,
              -6, -11, -16, -16,   0,  15,   0, -16, -16,-
11, -6,
              -4,  -8, -12, -16, -17, -17, -17, -16, -12, -
8, -4,
              -3,  -5,  -8, -11, -13, -13, -13, -11,  -8, -
5, -3,
              -1,  -3,  -4,  -6, -7,  -8,  -7,  -6,  -4,  -
3, -1 };
    Mat M=Mat(11,11,CV_32F,m).clone();
```

```
    Kernel Mask(11, 11, 5, 5, M);

    float ZeroCross;
    for (int sI = 0; sI <= src.rows-1; sI++)
    {
        for (int sJ = 0; sJ <= src.cols-1; sJ++)
        {
            ZeroCross=ZeroCrossPixel(src, Mask, sI, sJ);
            if( -ZeroCross >= threshold )
                res.at<uchar>(sI,sJ)=0;
            else
                res.at<uchar>(sI,sJ)=255;
        }
    }
}
```

Threshold 取 1 的處理結果：