lab4

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Task1

For task1, there's not much related to computer vision but there are some tricks for c++.
Since we should not use global variable, i create a `class` for task1. In task1, we need to use `track bar`, however, the callback of the `track bar` in OpenCV should be `static`. So we need to create a callback function which is `static` type and contains the "real" callback function in it:

```
// real callback function
void CannyThreshold() {
    blur( src_gray, detected_edges, Size(3,3) );
    Canny( detected_edges, detected_edges, lowThreshold, lowThreshold * ratio, kernel_si
    dst = Scalar::all(0);
    src.copyTo( dst, detected_edges);
    imshow( window_name, dst );
}

// callback function
static void callback_(int, void* userdata) {
    Task1 *tmp = (Task1*)userdata;
    tmp->CannyThreshold();
}

// construction function
Task1() {
    ...
    createTrackbar( "Min Threshold:", window_name, &lowThreshold, max_lowThreshold, call
    callback_(0, this);
    ...
}
```

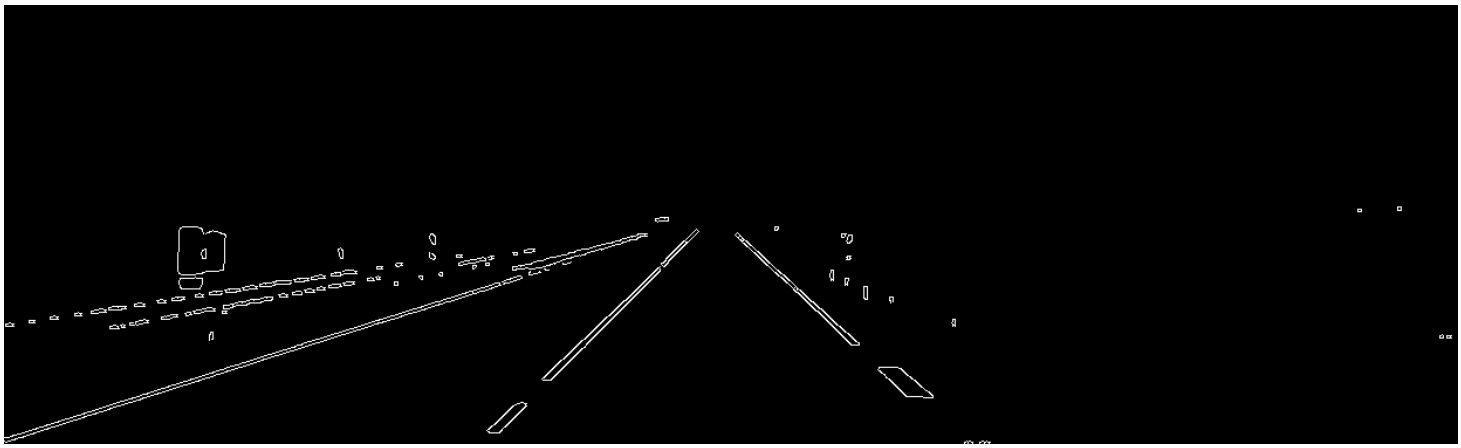
Task3

In task3 we need to detect white markings on the road by Hough transform. However, there are too many lines in the picture. So i decide to do some pre-operation. Since we only need white marking, so i remove all the element that is far from the color "white":

```
void colorThreshold(int T, Mat *src) {
    int row = src->rows;
    int col = src->cols;
    int r, g, b;
    for(int i = 0; i < row; i++) {
        for(int j = 0; j < col; j++) {
            Vec3b pixel = (*src).at<Vec3b>(Point (j, i));
            b = pixel[0];
            g = pixel[1];
            r = pixel[2];

            if(abs(b - 255) < T && abs(g - 255) < T && abs(r - 255) < T ) {
                (*src).at<Vec3b>(i, j) = Vec3b(255, 255, 255);
            } else {
                (*src).at<Vec3b>(i, j) = Vec3b(0, 0, 0);
            }
        }
    }
}
```

Then blur the image and use Canny to find out the edges:



Now it's easy to detect the **"white"** lines.

```
vector<Vec2f> lines;
HoughLines( dst, lines, 1, CV_PI / 90, 120, 0, 0 );
```

Task4

Task4 is to detect the circle in the image, just use `HoughCircles` .

```
HoughCircles(src_gray, circles, HOUGH_GRADIENT_ALT, 1.5, src_gray.rows / 16, 500, 0.8, 1
```

I choose `HOUGH_GRADIENT_ALT` , set the `minRadius` to `1` and the `maxRadius` to `30` .