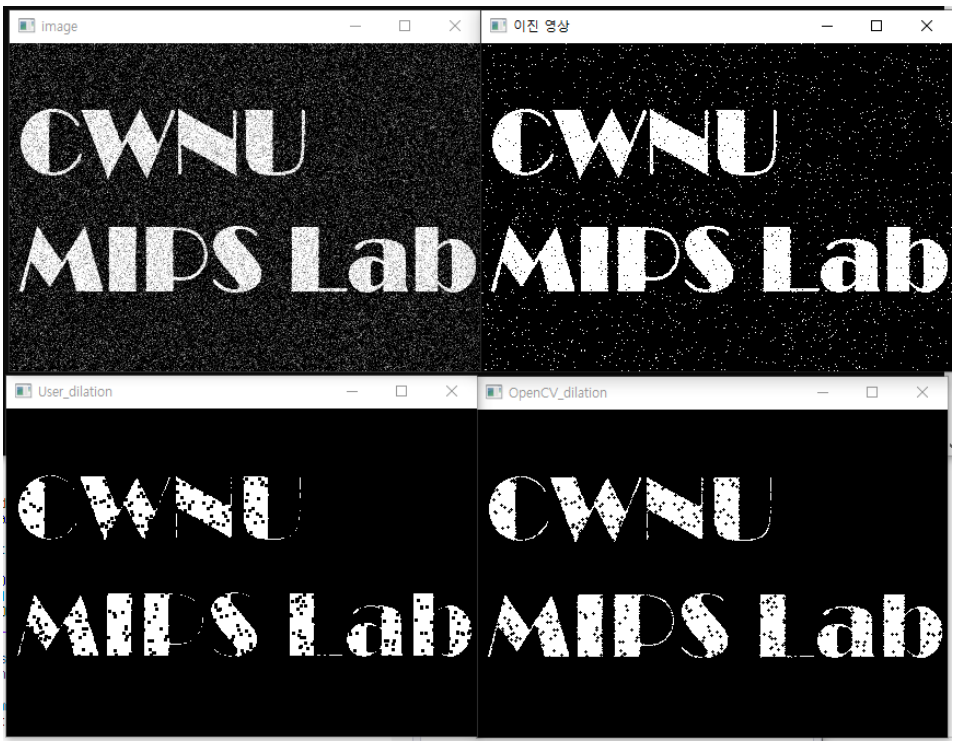
12-형태학적 처리.pdf 6~9page

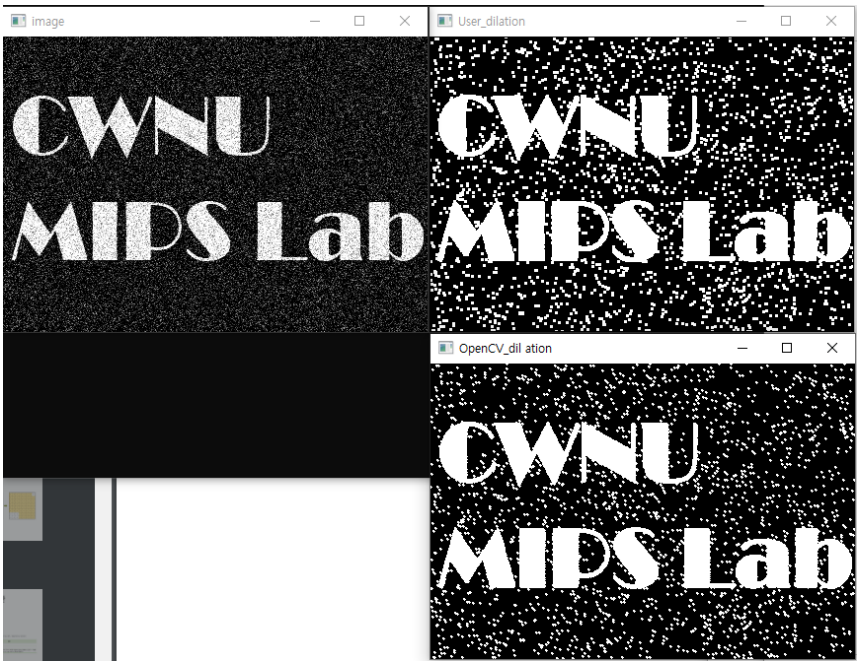
```cpp
#include <opencv2/opencv.hpp>
using namespace cv;
using namespace std;

bool check_match(Mat img, Point start, Mat mask, int mode = 0)
{
    for (int u = 0; u < mask.rows; u++) {
        for (int v = 0; v < mask.cols; v++) {
            Point pt(v, u);
            int m = mask.at<uchar>(pt);
            int p = img.at<uchar>(start + pt);

            bool ch = (p == 255);
            if (m == 1 && ch == mode)
                return false;
        }
    }
    return true;
}
void erosion(Mat img, Mat& dst, Mat mask)  // 침식 연산 함수
{
    dst = Mat(img.size(), CV_8U, Scalar(0));
    if (mask.empty()) mask = Mat(3, 3, CV_8UC1, Scalar(1));

    Point h_m = mask.size() / 2;  //마스크 절반 크기
    for (int i = h_m.y; i < img.rows - h_m.y; i++) {
        for (int j = h_m.x; j < img.cols - h_m.x; j++)
        {
            Point start = Point(j, i) - h_m;
            bool check = check_match(img, start, mask, 0); //원소 일치 여부 비교
            dst.at<uchar>(i, j) = (check) ? 255 : 0; //출력 화소 저장
        }
    }
}

int main()
{
    Mat image = imread("C:/Users/Chan's Victus/Documents/class/Project/image/morph_
    CV_Assert(image.data);
    Mat th_img, dst1, dst2;
    threshold(image, th_img, 128, 255, THRESH_BINARY);

    uchar data[] = { 0, 1, 0,
                     1, 1, 1,
                     0, 1, 0 };
    Mat mask(3, 3, CV_8UC1, data);

    erosion(th_img, dst1, (Mat)mask);
    morphologyEx(th_img, dst2, MORPH_ERODE, mask);

    imshow("image", image), imshow("이진 영상", th_img);
    imshow("User_dilation", dst1), imshow("OpenCV_dilation", dst2);
    waitKey();
    return 0;
}
```



12-형태학적 처리.pdf 10~12page

```cpp
#include <opencv2/opencv.hpp>
using namespace cv;
using namespace std;

bool check_match(Mat img, Point start, Mat mask, int mode = 1) { ... }

void dilation(Mat img, Mat& dst, Mat mask)
{
    dst = Mat(img.size(), CV_8U, Scalar(0));
    if (mask.empty()) mask = Mat(3, 3, CV_8UC1, Scalar(0));

    Point h_m = mask.size() / 2;
    for (int i = h_m.y; i < img.rows - h_m.y; i++) {
        for (int j = h_m.x; j < img.cols - h_m.x; j++)
        {
            Point start = Point(j, i) - h_m;
            bool check = check_match(img, start, mask, 1);
            dst.at<uchar>(i, j) = (check) ? 0 : 255;
        }
    }
}
int main()
{
    Mat image = imread("C:/Users/Chan's Victus/Documents/class/Project/image/morph_
    CV_Assert(image.data);
    Mat th_img, dst1, dst2;
    threshold(image, th_img, 128, 255, THRESH_BINARY);

    Matx <uchar, 3, 3> mask;
    mask << 0, 1, 0,
            1, 1, 1,
            0, 1, 1;
    dilation(th_img, dst1, (Mat)mask);
    morphologyEx(th_img, dst2, MORPH_DILATE, mask);

    imshow("image", image), imshow("User_dilation", dst1);
    imshow("OpenCV_dil ation", dst2);
    waitKey();
    return 0;
}
```

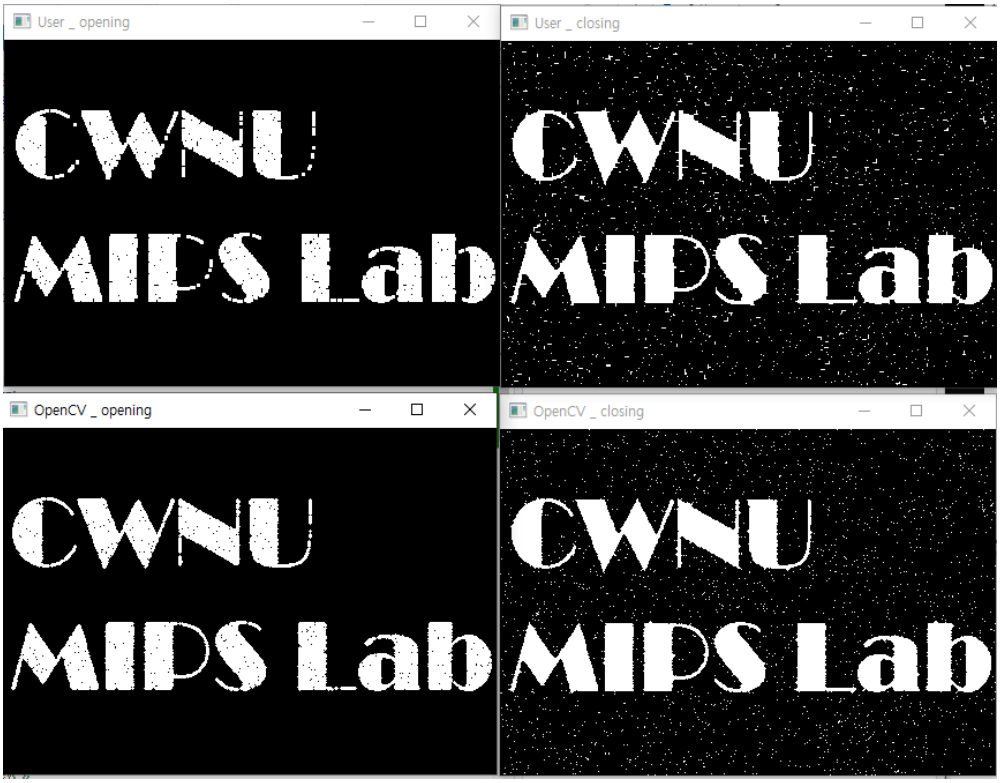
```
1>코드를 생성하고 있습니다.
1>Previous IPDB and IOBJ mismatch, fall back to full compilation.
1>All 101 functions were compiled because no usable IPDB/IOBJ from previous compilation was
1>코드를 생성했습니다.
1>Project.vcxproj -> C:₩Users₩Chan's Victus₩Documents₩class₩Project₩x64₩Release₩Project.exe
1>"Project.vcxproj" 프로젝트를 빌드했습니다.
========== 빌드: 1개 성공, 0개 실패, 0개 최신 상태, 0개 건너뜀 ==========
========== 빌드이(가) 오후 7:26에 시작되었고 01.708 초이(가) 소요됨 ==========
```



12-형태학적 처리.pdf 18~20page

```cpp
#include <opencv2/opencv.hpp>
using namespace cv;
using namespace std;

bool check_match(Mat img, Point start, Mat mask, int mode){ ... }

void erosion(Mat img, Mat& dst, Mat mask){ ... }

void dilation(Mat img, Mat& dst, Mat mask){ ... }

void opening(Mat img, Mat& dst, Mat mask)
{
    Mat tmp;
    erosion(img, tmp, mask);
    dilation(tmp, dst, mask);
}

void closing(Mat img, Mat& dst, Mat mask)
{
    Mat tmp;
    dilation(img, tmp, mask);
    erosion(tmp, dst, mask);
}
int main()
{
    Mat image = imread("C:/Users/Chan's Victus/Documents/class/Project/image/morph_
    CV_Assert(image.data);
    Mat th_img, dst1, dst2, dst3, dst4;
    threshold(image, th_img, 128, 255, THRESH_BINARY);

    Matx <uchar, 3, 3> mask;
    mask << 0, 1, 0,
        1, 1, 1,
        0, 1, 0;

    opening(th_img, dst1, (Mat)mask);
    closing(th_img, dst2, (Mat)mask);
    morphologyEx(th_img, dst3, MORPH_OPEN, mask);
    morphologyEx(th_img, dst4, MORPH_CLOSE, mask);

    imshow("User _ opening", dst1); imshow("User _ closing", dst2);
    imshow("OpenCV _ opening", dst3); imshow("OpenCV _ closing", dst4);
    waitKey();
    return 0;
}
```

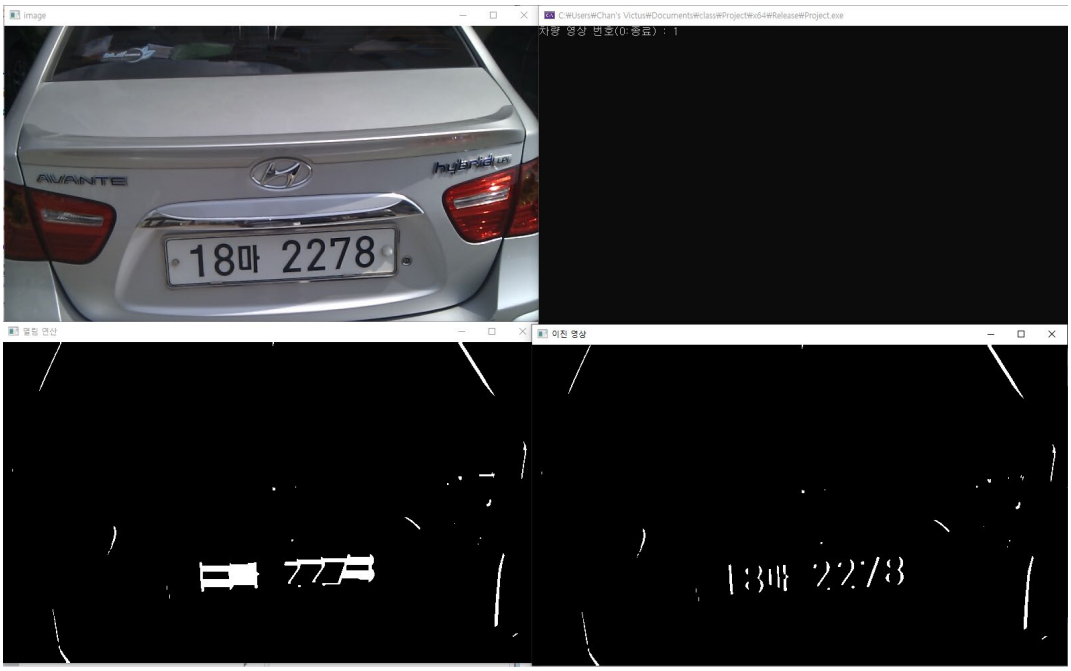
```
1>101 of 104 functions (97.1%) were compiled, the rest were copied from previous compilatio
1>  3 functions were new in current compilation
1>  1 functions had inline decision re-evaluated but remain unchanged
1>코드를 생성했습니다.
1>Project.vcxproj -> C:₩Users₩Chan's Victus₩Documents₩class₩Project₩x64₩Release₩Project.exe
1>"Project.vcxproj" 프로젝트를 빌드했습니다.
========== 빌드: 1개 성공, 0개 실패, 0개 최신 상태, 0개 건너뜀 ==========
========== 빌드이(가) 오후 7:34에 시작되었고 01.741 초이(가) 소요됨 ==========
```



12-형태학적 처리.pdf 23~24page

```cpp
#include <opencv2/opencv.hpp>
using namespace cv;
using namespace std;
int main()
{
    while (1)
    {
        int no;
        cout << "차량 영상 번호(0:종료) : ";
        cin >> no;
        if (no == 0) break;

        string fname = format("C:/Users/Chan's Victus/Documents/class/Project/test_
        Mat image = imread(fname, 1);
        if (image.empty()) {
            cout << to_string(no) + "번 영상 파일이 없습니다. " << endl;
            continue;
        }
        Mat gray, sobel, th_img, morph;
        Mat kernel(5, 25, CV_8UC1, Scalar(1));
        cvtColor(image, gray, COLOR_BGR2GRAY);

        blur(gray, gray, Size(5, 5));
        Sobel(gray, gray, CV_8U, 1, 0, 3);

        threshold(gray, th_img, 120, 255, THRESH_BINARY);
        morphologyEx(th_img, morph, MORPH_CLOSE, kernel);

        imshow("image", image);
        imshow("이진 영상", th_img), imshow("열림 연산", morph);
        waitKey(0);
    }
    return 0;
}
```

```
1>1 of 124 functions ( 0.8%) were compiled, the rest were copied from previous compilation.
1>  0 functions were new in current compilation
1>  0 functions had inline decision re-evaluated but remain unchanged
1>코드를 생성했습니다.
1>Project.vcxproj -> C:\Users\Chan's Victus\Documents\class\Project\x64\Release\Project.exe
1>"Project.vcxproj" 프로젝트를 빌드했습니다.
========== 빌드: 1개 성공, 0개 실패, 0개 최신 상태, 0개 건너뜀 ==========
========== 빌드이(가) 오후 7:44에 시작되었고 02.028 초이(가) 소요됨 ==========
```



12-형태학적 처리.pdf 27page