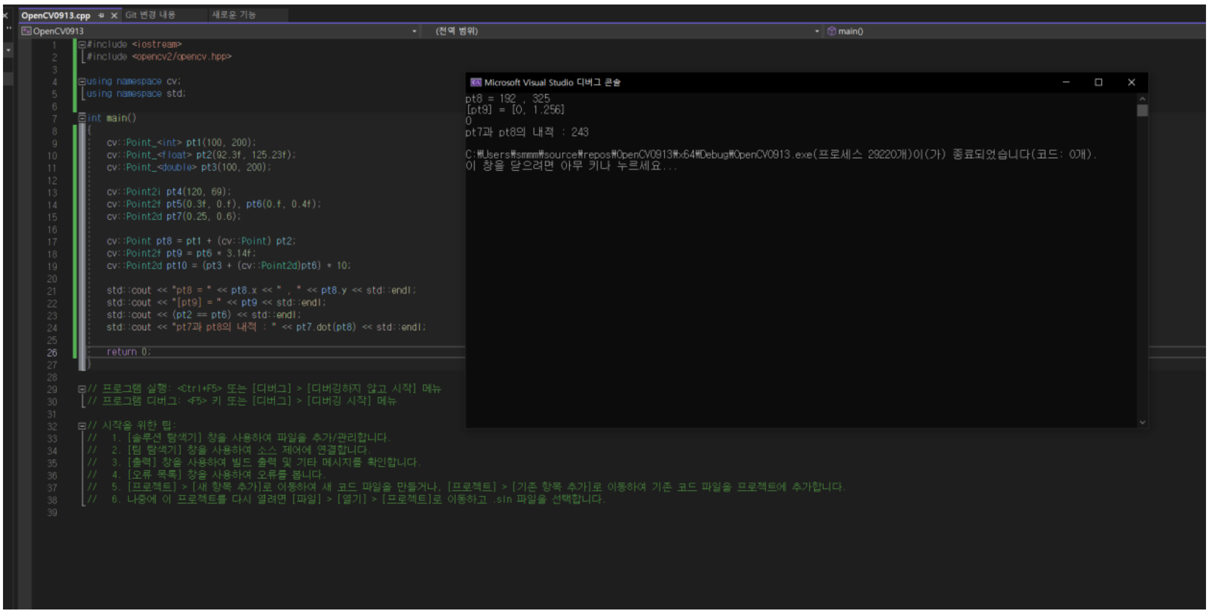
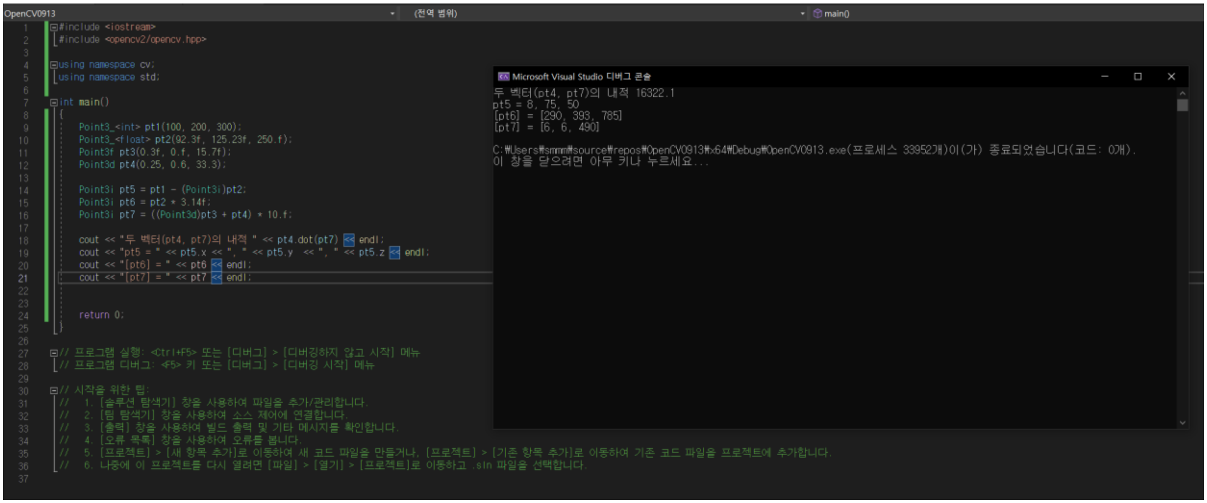


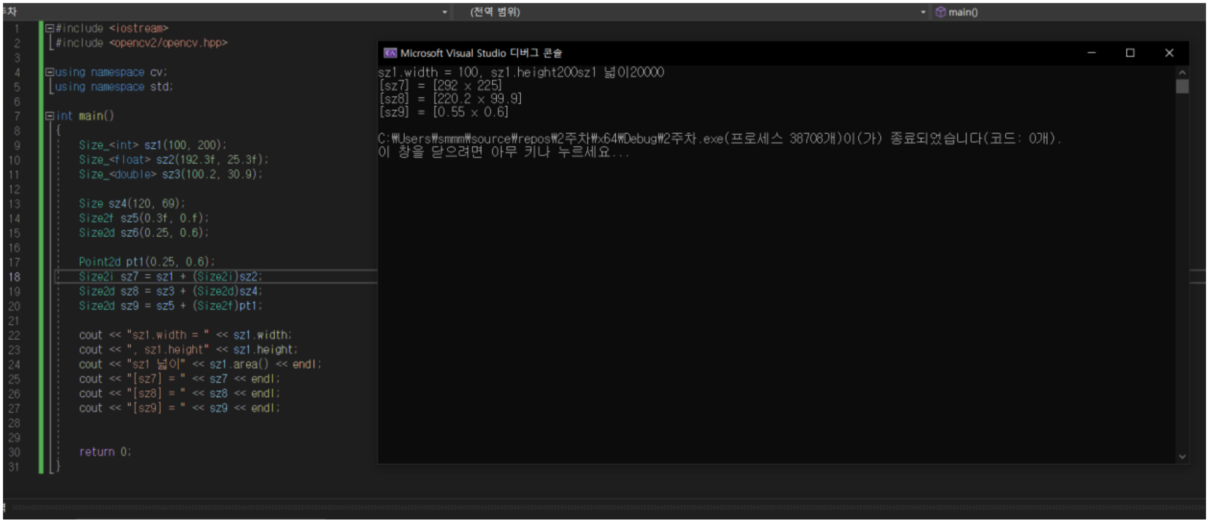
```cpp
#include <iostream>
#include <opencv2/opencv.hpp>

using namespace cv;
using namespace std;

int main()
{
    cv::Point_<int> pt1(100, 200);
    cv::Point_<float> pt2(92.3f, 125.23f);
    cv::Point_<double> pt3(100, 200);

    cv::Point2i pt4(120, 69);
    cv::Point2f pt5(0.3f, 0.f), pt6(0.f, 0.4f);
    cv::Point2d pt7(0.25, 0.6);

    cv::Point pt8 = pt1 + (cv::Point) pt2;
    cv::Point2f pt9 = pt6 * 3.14f;
    cv::Point2d pt10 = (pt3 + (cv::Point2d)pt6) * 10;

    std::cout << "pt8 = " << pt8.x << " , " << pt8.y << std::endl;
    std::cout << "[pt9] = " << pt9 << std::endl;
    std::cout << (pt2 == pt6) << std::endl;
    std::cout << "pt7과 pt8의 내적 : " << pt7.dot(pt8) << std::endl;

    return 0;
}

// 프로그램 실행: <Ctrl+F5> 또는 [디버그] > [디버깅하지 않고 시작] 메뉴
// 프로그램 디버그: <F5> 키 또는 [디버그] > [디버깅 시작] 메뉴

// 시작을 위한 팁:
//   1. [솔루션 탐색기] 창을 사용하여 파일을 추가/관리합니다.
//   2. [팀 탐색기] 창을 사용하여 소스 제어에 연결합니다.
//   3. [출력] 창을 사용하여 빌드 출력 및 기타 메시지를 확인합니다.
//   4. [오류 목록] 창을 사용하여 오류를 봅니다.
//   5. [프로젝트] > [새 항목 추가]로 이동하여 새 코드 파일을 만들거나, [프로젝트] > [기존 항목 추가]로 이동하여 기존 코드 파일을 프로젝트에 추가합니다.
//   6. 나중에 이 프로젝트를 다시 열려면 [파일] > [열기] > [프로젝트]로 이동하고 .sln 파일을 선택합니다.
```

```
pt8 = 192 , 325
[pt9] = [0, 1.256]
0
pt7과 pt8의 내적 : 243

C:₩Users₩smmm₩source₩repos₩OpenCV0913₩x64₩Debug₩OpenCV0913.exe(프로세스 29220개)이(가) 종료되었습니다(코드: 0개).
이 창을 닫으려면 아무 키나 누르세요...
```



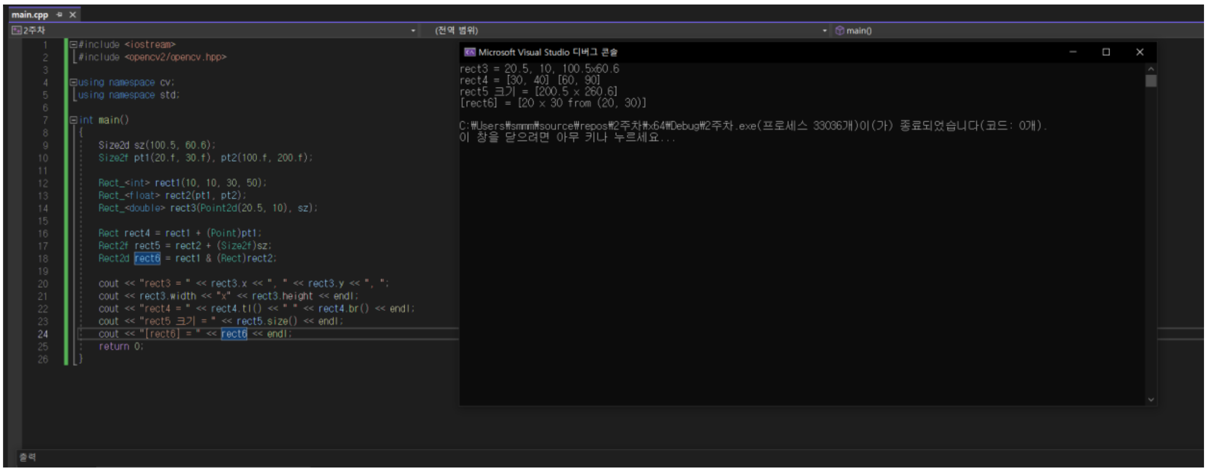
```cpp
#include <iostream>
#include <opencv2/opencv.hpp>

using namespace cv;
using namespace std;

int main()
{
    Point3_<int> pt1(100, 200, 300);
    Point3_<float> pt2(92.3f, 125.23f, 250.f);
    Point3f pt3(0.3f, 0.f, 15.7f);
    Point3d pt4(0.25, 0.6, 33.3);

    Point3i pt5 = pt1 - (Point3i)pt2;
    Point3i pt6 = pt2 * 3.14f;
    Point3i pt7 = ((Point3d)pt3 + pt4) * 10.f;

    cout << "두 벡터(pt4, pt7)의 내적 " << pt4.dot(pt7) << endl;
    cout << "pt5 = " << pt5.x << ", " << pt5.y  << ", " << pt5.z << endl;
    cout << "[pt6] = " << pt6 << endl;
    cout << "[pt7] = " << pt7 << endl;


    return 0;
}

// 프로그램 실행: <Ctrl+F5> 또는 [디버그] > [디버깅하지 않고 시작] 메뉴
// 프로그램 디버그: <F5> 키 또는 [디버그] > [디버깅 시작] 메뉴

// 시작을 위한 팁:
//   1. [솔루션 탐색기] 창을 사용하여 파일을 추가/관리합니다.
//   2. [팀 탐색기] 창을 사용하여 소스 제어에 연결합니다.
//   3. [출력] 창을 사용하여 빌드 출력 및 기타 메시지를 확인합니다.
//   4. [오류 목록] 창을 사용하여 오류를 봅니다.
//   5. [프로젝트] > [새 항목 추가]로 이동하여 새 코드 파일을 만들거나, [프로젝트] > [기존 항목 추가]로 이동하여 기존 코드 파일을 프로젝트에 추가합니다.
//   6. 나중에 이 프로젝트를 다시 열려면 [파일] > [열기] > [프로젝트]로 이동하고 .sln 파일을 선택합니다.
```

```
두 벡터(pt4, pt7)의 내적 16322.1
pt5 = 8, 75, 50
[pt6] = [290, 393, 785]
[pt7] = [6, 6, 490]

C:₩Users₩smmm₩source₩repos₩OpenCV0913₩x64₩Debug₩OpenCV0913.exe(프로세스 33952개)이(가) 종료되었습니다(코드: 0개).
이 창을 닫으려면 아무 키나 누르세요...
```



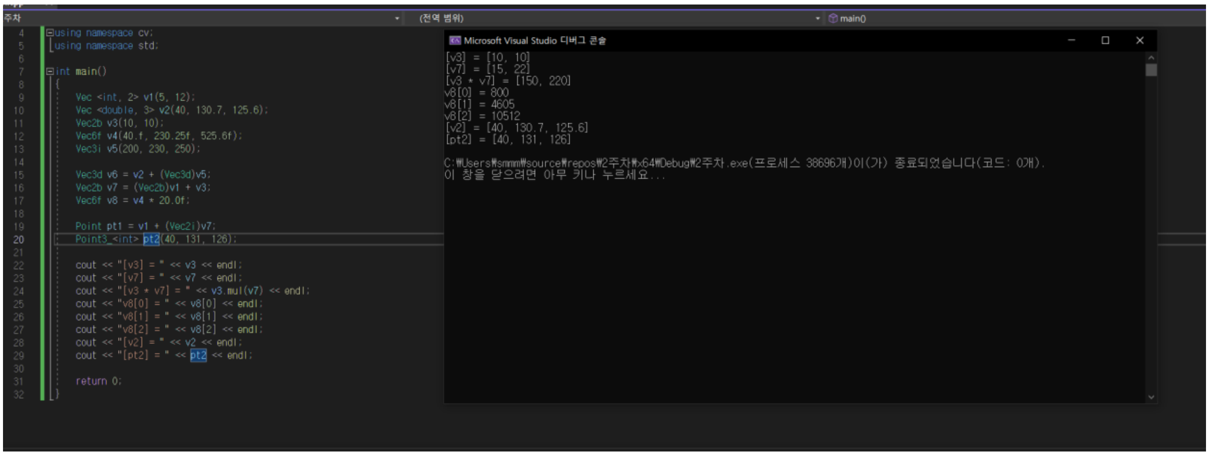
```cpp
#include <iostream>
#include <opencv2/opencv.hpp>

using namespace cv;
using namespace std;

int main()
{
    Size_<int> sz1(100, 200);
    Size_<float> sz2(192.3f, 25.3f);
    Size_<double> sz3(100.2, 30.9);

    Size sz4(120, 69);
    Size2f sz5(0.3f, 0.f);
    Size2d sz6(0.25, 0.6);

    Point2d pt1(0.25, 0.6);
    Size2i sz7 = sz1 + (Size2i)sz2;
    Size2d sz8 = sz3 + (Size2d)sz4;
    Size2d sz9 = sz5 + (Size2f)pt1;

    cout << "sz1.width = " << sz1.width;
    cout << ", sz1.height" << sz1.height;
    cout << "sz1 넓이" << sz1.area() << endl;
    cout << "[sz7] = " << sz7 << endl;
    cout << "[sz8] = " << sz8 << endl;
    cout << "[sz9] = " << sz9 << endl;


    return 0;
}
```

```
sz1.width = 100, sz1.height200sz1 넓이20000
[sz7] = [292 x 225]
[sz8] = [220.2 x 99.9]
[sz9] = [0.55 x 0.6]

C:₩Users₩smmm₩source₩repos₩2주차₩x64₩Debug₩2주차.exe(프로세스 38708개)이(가) 종료되었습니다(코드: 0개).
이 창을 닫으려면 아무 키나 누르세요...
```



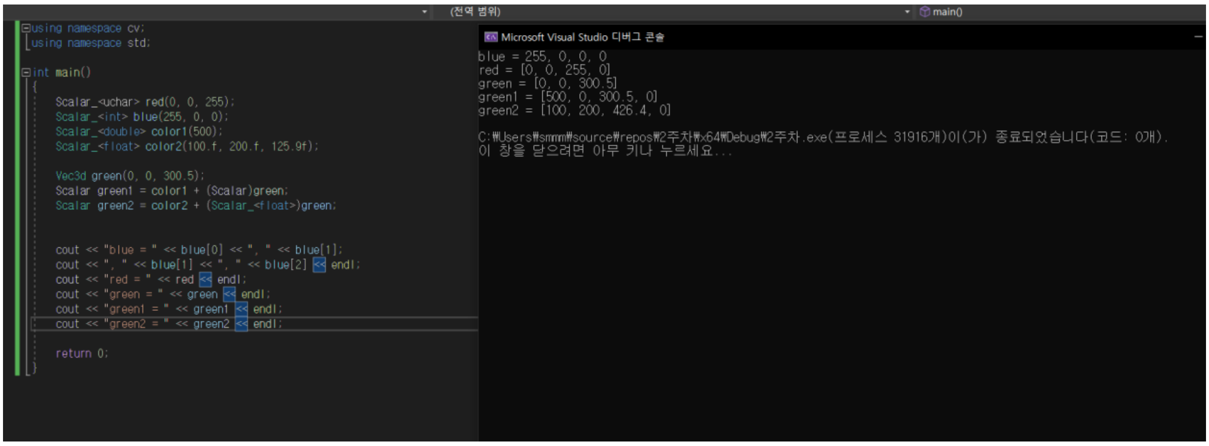
```cpp
#include <iostream>
#include <opencv2/opencv.hpp>

using namespace cv;
using namespace std;

int main()
{
    Size2d sz(100.5, 60.6);
    Size2f pt1(20.f, 30.f), pt2(100.f, 200.f);

    Rect_<int> rect1(10, 10, 30, 50);
    Rect_<float> rect2(pt1, pt2);
    Rect_<double> rect3(Point2d(20.5, 10), sz);

    Rect rect4 = rect1 + (Point)pt1;
    Rect2f rect5 = rect2 + (Size2f)sz;
    Rect2d rect6 = rect1 & (Rect)rect2;

    cout << "rect3 = " << rect3.x << ", " << rect3.y << ", ";
    cout << rect3.width << "x" << rect3.height << endl;
    cout << "rect4 = " << rect4.tl() << " " << rect4.br() << endl;
    cout << "rect5 크기 = " << rect5.size() << endl;
    cout << "[rect6] = " << rect6 << endl;
    return 0;
}
```

```
rect3 = 20.5, 10, 100.5x60.6
rect4 = [30, 40] [60, 90]
rect5 크기 = [200.5 x 260.6]
[rect6] = [20 x 30 from (20, 30)]

C:₩Users₩smmm₩source₩repos₩2주차₩x64₩Debug₩2주차.exe(프로세스 33036개)이(가) 종료되었습니다(코드: 0개).
이 창을 닫으려면 아무 키나 누르세요...
```



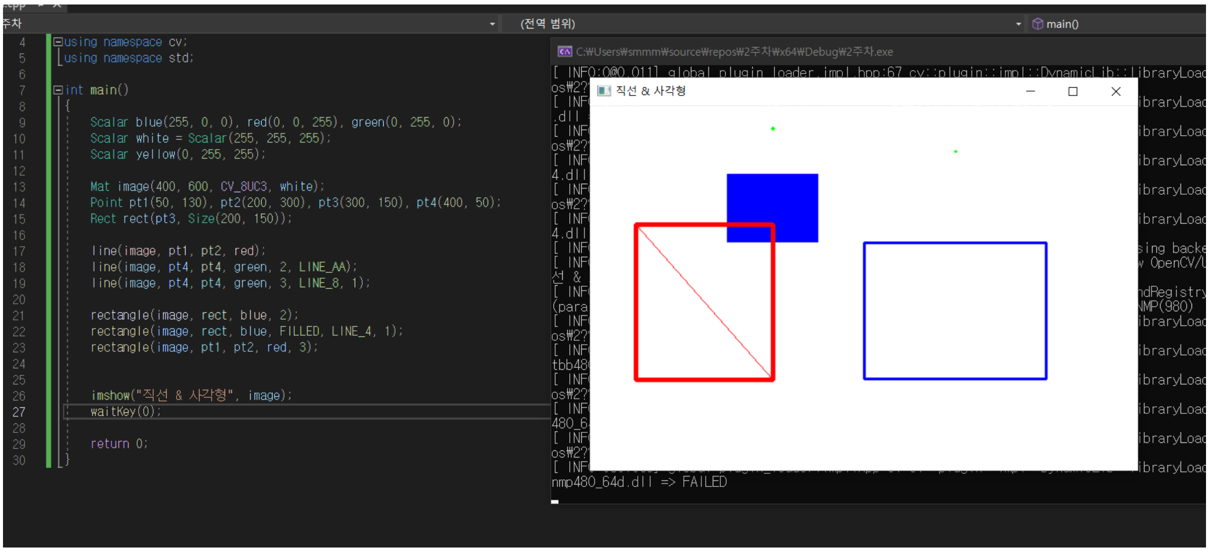
```cpp
using namespace cv;
using namespace std;

int main()
{
    Vec <int, 2> v1(5, 12);
    Vec <double, 3> v2(40, 130.7, 125.6);
    Vec2b v3(10, 10);
    Vec6f v4(40.f, 230.25f, 525.6f);
    Vec3i v5(200, 230, 250);

    Vec3d v6 = v2 + (Vec3d)v5;
    Vec2b v7 = (Vec2b)v1 + v3;
    Vec6f v8 = v4 * 20.0f;

    Point pt1 = v1 + (Vec2i)v7;
    Point3_<int> pt2(40, 131, 126);

    cout << "[v3] = " << v3 << endl;
    cout << "[v7] = " << v7 << endl;
    cout << "[v3 * v7] = " << v3.mul(v7) << endl;
    cout << "v8[0] = " << v8[0] << endl;
    cout << "v8[1] = " << v8[1] << endl;
    cout << "v8[2] = " << v8[2] << endl;
    cout << "[v2] = " << v2 << endl;
    cout << "[pt2] = " << pt2 << endl;

    return 0;
}
```

```
[v3] = [10, 10]
[v7] = [15, 22]
[v3 * v7] = [150, 220]
v8[0] = 800
v8[1] = 4605
v8[2] = 10512
[v2] = [40, 130.7, 125.6]
[pt2] = [40, 131, 126]

C:₩Users₩smmm₩source₩repos₩2주차₩x64₩Debug₩2주차.exe(프로세스 38696개)이(가) 종료되었습니다(코드: 0개).
이 창을 닫으려면 아무 키나 누르세요...
```



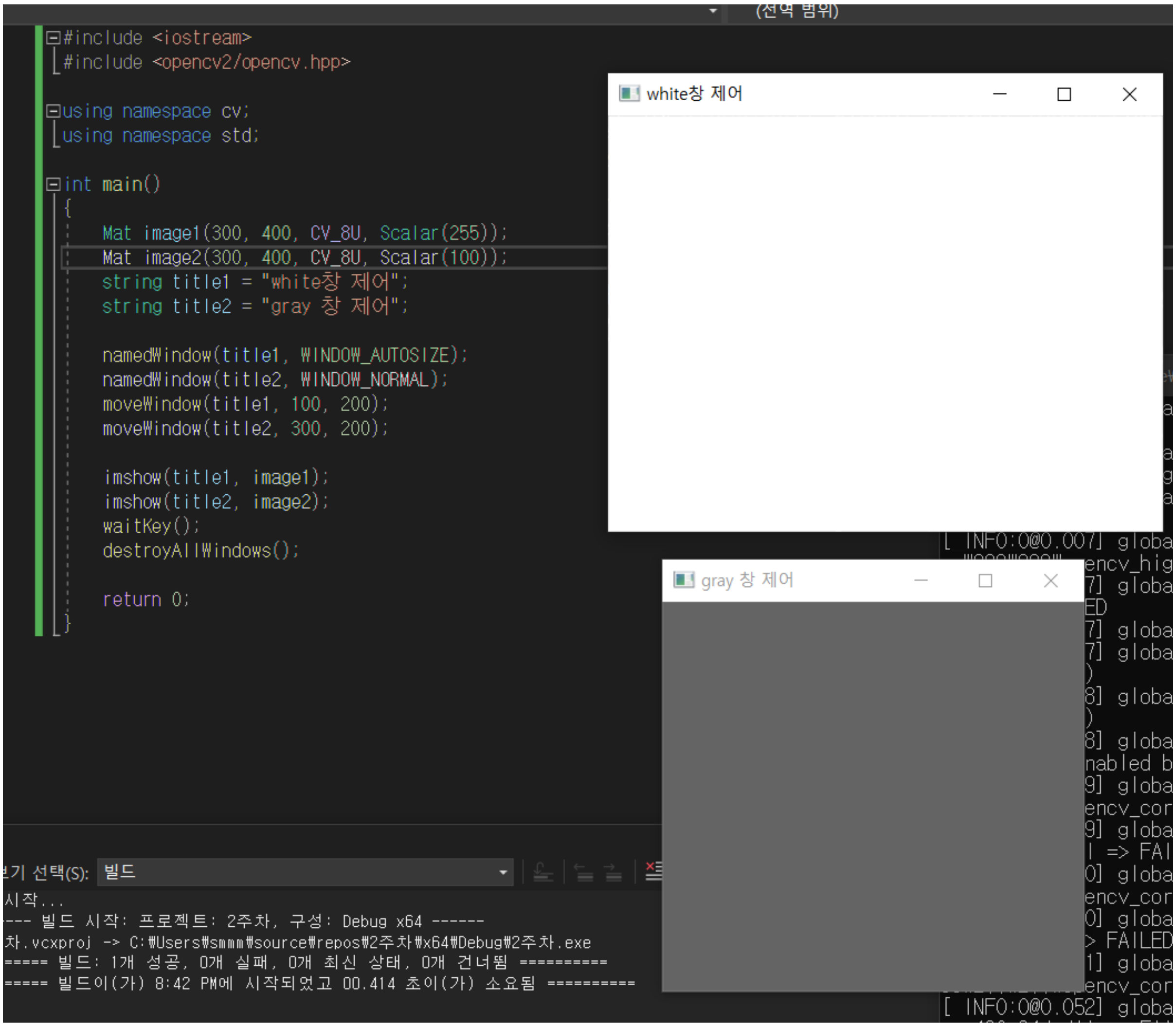
```cpp
using namespace cv;
using namespace std;

int main()
{
    Scalar_<uchar> red(0, 0, 255);
    Scalar_<int> blue(255, 0, 0);
    Scalar_<double> color1(500);
    Scalar_<float> color2(100.f, 200.f, 125.9f);

    Vec3d green(0, 0, 300.5);
    Scalar green1 = color1 + (Scalar)green;
    Scalar green2 = color2 + (Scalar_<float>)green;


    cout << "blue = " << blue[0] << ", " << blue[1];
    cout << ", " << blue[1] << ", " << blue[2] << endl;
    cout << "red = " << red << endl;
    cout << "green = " << green << endl;
    cout << "green1 = " << green1 << endl;
    cout << "green2 = " << green2 << endl;

    return 0;
}
```

```
blue = 255, 0, 0, 0
red = [0, 0, 255, 0]
green = [0, 0, 300.5]
green1 = [500, 0, 300.5, 0]
green2 = [100, 200, 426.4, 0]

C:₩Users₩smmm₩source₩repos₩2주차₩x64₩Debug₩2주차.exe(프로세스 31916개)이(가) 종료되었습니다(코드: 0개).
이 창을 닫으려면 아무 키나 누르세요...
```



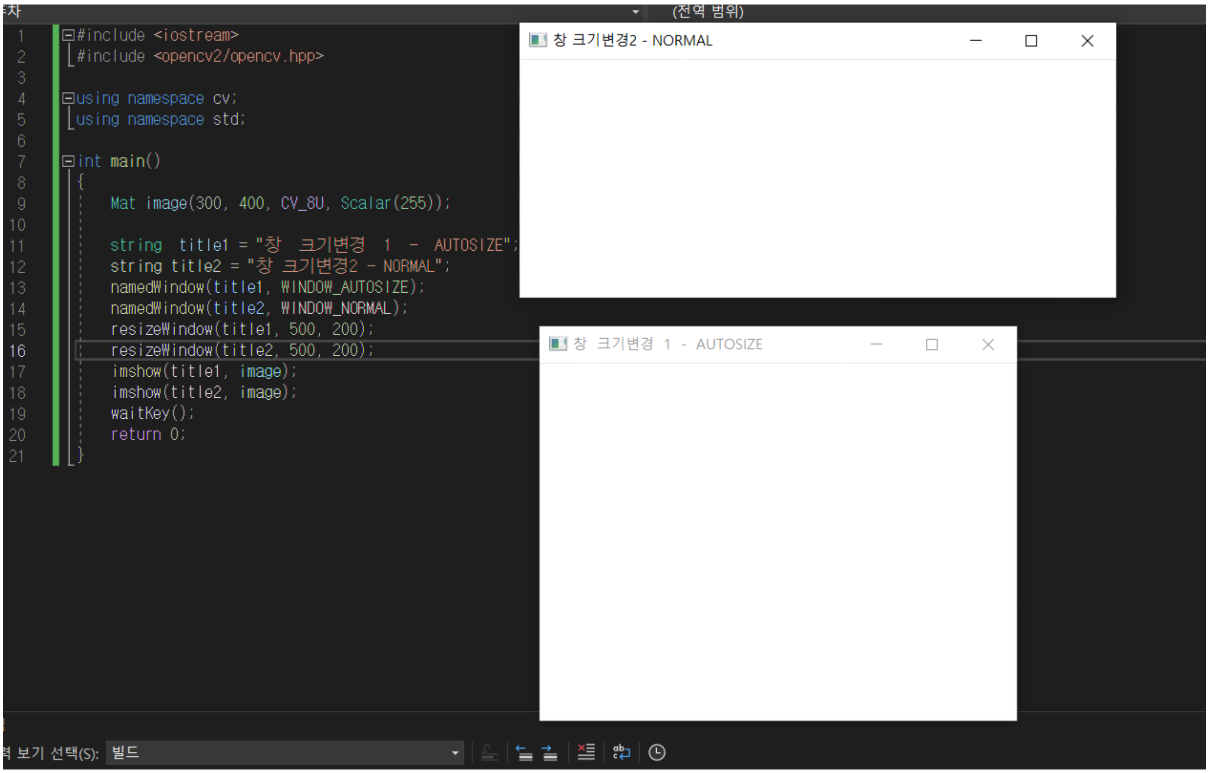
```cpp
using namespace cv;
using namespace std;

int main()
{
    Scalar blue(255, 0, 0), red(0, 0, 255), green(0, 255, 0);
    Scalar white = Scalar(255, 255, 255);
    Scalar yellow(0, 255, 255);

    Mat image(400, 600, CV_8UC3, white);
    Point pt1(50, 130), pt2(200, 300), pt3(300, 150), pt4(400, 50);
    Rect rect(pt3, Size(200, 150));

    line(image, pt1, pt2, red);
    line(image, pt4, pt4, green, 2, LINE_AA);
    line(image, pt4, pt4, green, 3, LINE_8, 1);

    rectangle(image, rect, blue, 2);
    rectangle(image, rect, blue, FILLED, LINE_4, 1);
    rectangle(image, pt1, pt2, red, 3);


    imshow("직선 & 사각형", image);
    waitKey(0);

    return 0;
}
```

```
C:₩Users₩smmm₩source₩repos₩2주차₩x64₩Debug₩2주차.exe
[ INFO:0@0.011] global plugin_loader_impl.hpp:67 cv::plugin::impl::DynamicLib::libraryLoad
nmp480_64d.dll => FAILED
```

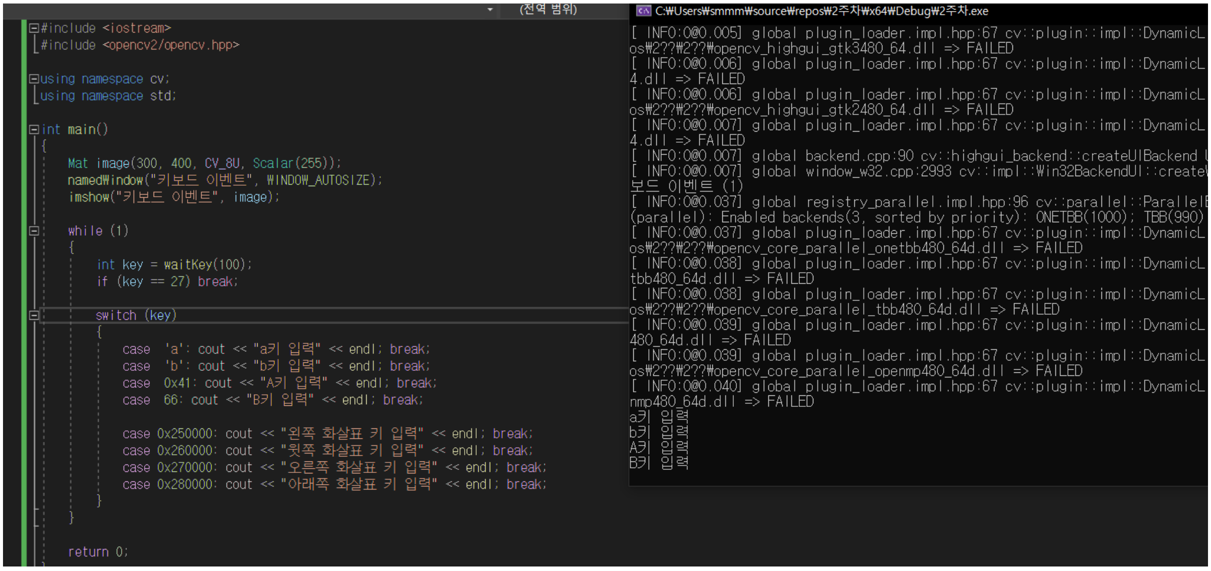


```cpp
#include <iostream>
#include <opencv2/opencv.hpp>

using namespace cv;
using namespace std;

int main()
{
    Mat image1(300, 400, CV_8U, Scalar(255));
    Mat image2(300, 400, CV_8U, Scalar(100));
    string title1 = "white창 제어";
    string title2 = "gray 창 제어";

    namedWindow(title1, WINDOW_AUTOSIZE);
    namedWindow(title2, WINDOW_NORMAL);
    moveWindow(title1, 100, 200);
    moveWindow(title2, 300, 200);

    imshow(title1, image1);
    imshow(title2, image2);
    waitKey();
    destroyAllWindows();

    return 0;
}
```

```
시작...
--- 빌드 시작: 프로젝트: 2주차, 구성: Debug x64 ------
차.vcxproj -> C:₩Users₩smmm₩source₩repos₩2주차₩x64₩Debug₩2주차.exe
===== 빌드: 1개 성공, 0개 실패, 0개 최신 상태, 0개 건너뜀 ==========
===== 빌드이(가) 8:42 PM에 시작되었고 00.414 초이(가) 소요됨 ==========
```

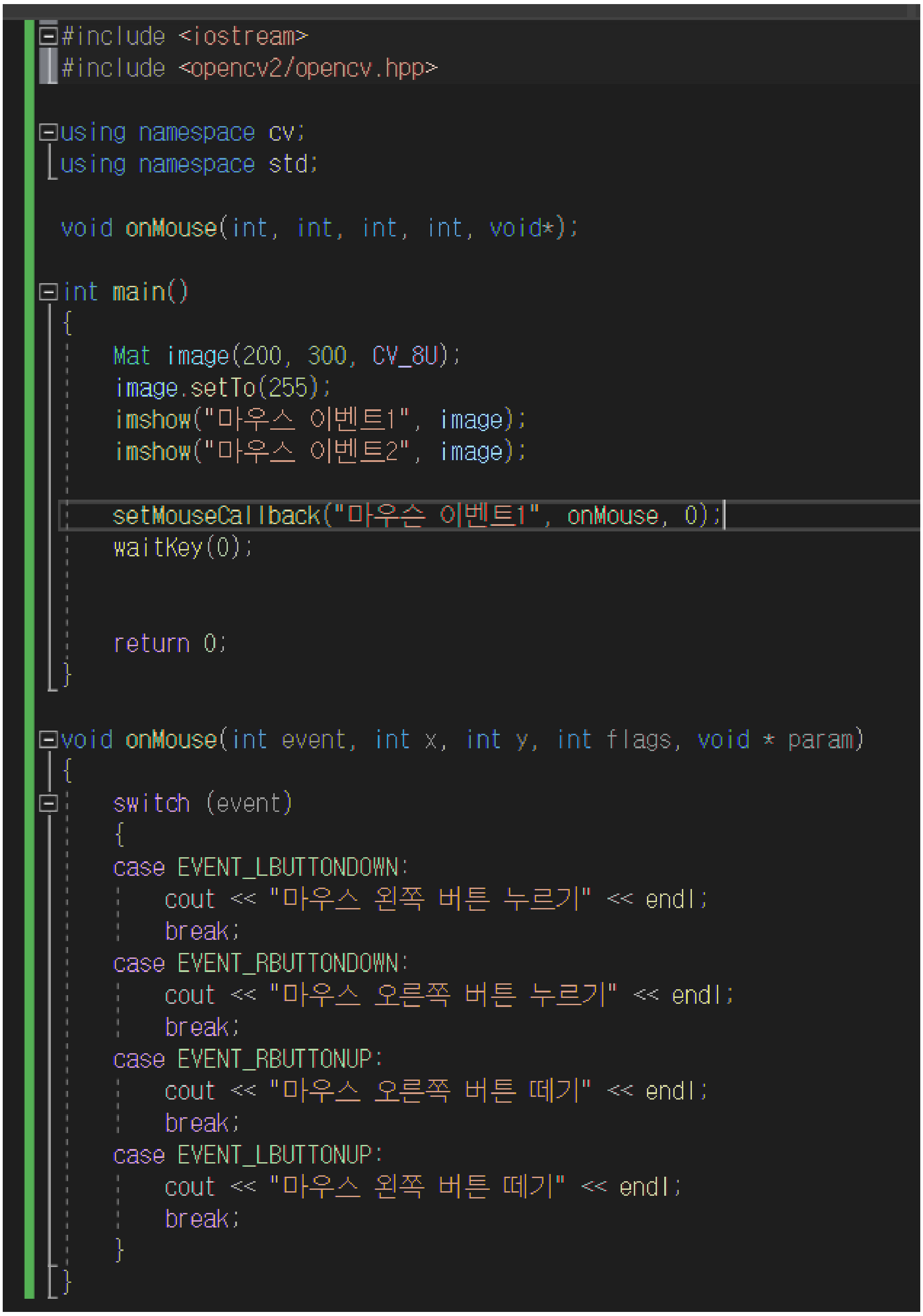


```cpp
#include <iostream>
#include <opencv2/opencv.hpp>

using namespace cv;
using namespace std;

int main()
{
    Mat image(300, 400, CV_8U, Scalar(255));

    string title1 = "창 크기변경 1 - AUTOSIZE";
    string title2 = "창 크기변경2 - NORMAL";
    namedWindow(title1, WINDOW_AUTOSIZE);
    namedWindow(title2, WINDOW_NORMAL);
    resizeWindow(title1, 500, 200);
    resizeWindow(title2, 500, 200);
    imshow(title1, image);
    imshow(title2, image);
    waitKey();
    return 0;
}
```

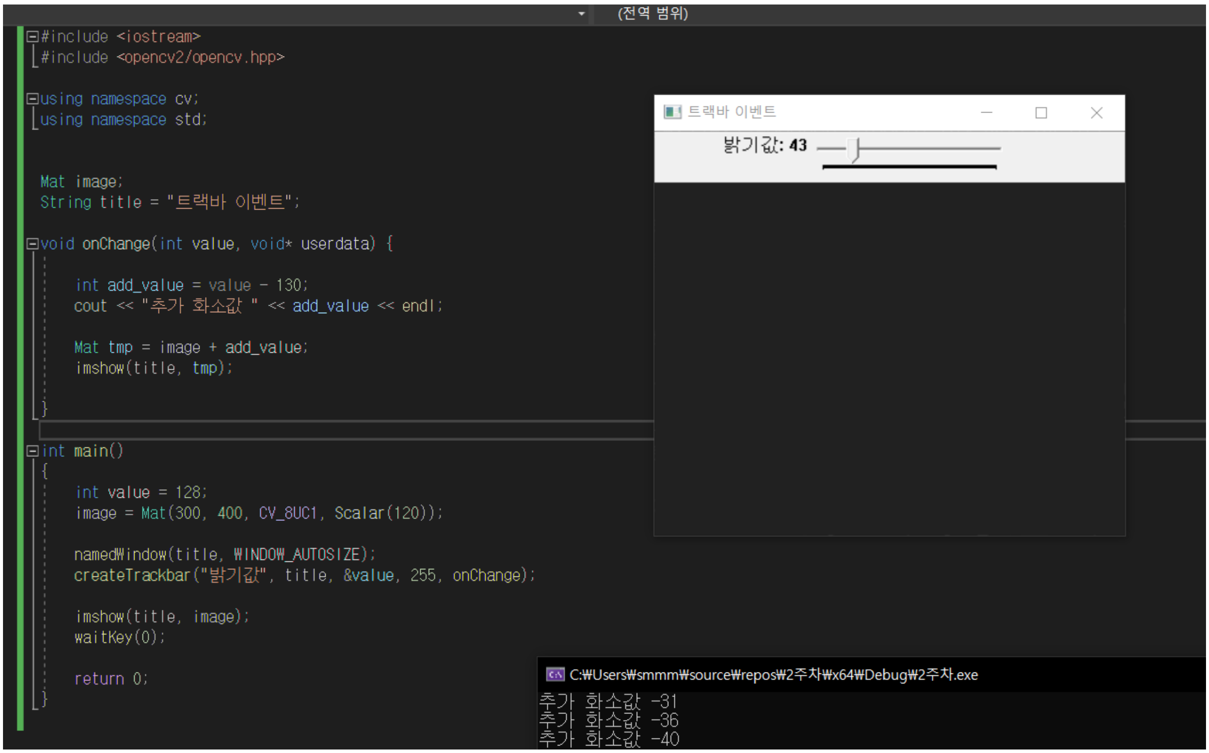


```cpp
#include <iostream>
#include <opencv2/opencv.hpp>

using namespace cv;
using namespace std;

int main()
{
    Mat image(300, 400, CV_8U, Scalar(255));
    namedWindow("키보드 이벤트", WINDOW_AUTOSIZE);
    imshow("키보드 이벤트", image);

    while (1)
    {
        int key = waitKey(100);
        if (key == 27) break;

        switch (key)
        {
            case  'a': cout << "a키 입력" << endl; break;
            case  'b': cout << "b키 입력" << endl; break;
            case  0x41: cout << "A키 입력" << endl; break;
            case  66: cout << "B키 입력" << endl; break;

            case 0x250000: cout << "왼쪽 화살표 키 입력" << endl; break;
            case 0x260000: cout << "윗쪽 화살표 키 입력" << endl; break;
            case 0x270000: cout << "오른쪽 화살표 키 입력" << endl; break;
            case 0x280000: cout << "아래쪽 화살표 키 입력" << endl; break;
        }
    }

    return 0;
```

```
[ INFO:0@0.005] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicL
os₩2??₩2??₩opencv_highgui_gtk3480_64.dll => FAILED
[ INFO:0@0.006] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicL
4.dll => FAILED
[ INFO:0@0.006] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicL
os₩2??₩2??₩opencv_highgui_gtk2480_64.dll => FAILED
[ INFO:0@0.007] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicL
4.dll => FAILED
[ INFO:0@0.007] global backend.cpp:90 cv::highgui_backend::createUIBackend U
[ INFO:0@0.007] global window_w32.cpp:2993 cv::impl::Win32BackendUI::createW
보드 이벤트 (1)
[ INFO:0@0.037] global registry_parallel.impl.hpp:96 cv::parallel::ParallelB
(parallel): Enabled backends(3, sorted by priority): ONETBB(1000); TBB(990)
[ INFO:0@0.037] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicL
os₩2??₩2??₩opencv_core_parallel_onetbb480_64d.dll => FAILED
[ INFO:0@0.038] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicL
tbb480_64d.dll => FAILED
[ INFO:0@0.038] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicL
os₩2??₩2??₩opencv_core_parallel_tbb480_64d.dll => FAILED
[ INFO:0@0.039] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicL
480_64d.dll => FAILED
[ INFO:0@0.039] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicL
os₩2??₩2??₩opencv_core_parallel_openmp480_64d.dll => FAILED
[ INFO:0@0.040] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicL
nmp480_64d.dll => FAILED
a키 입력
b키 입력
A키 입력
B키 입력
```

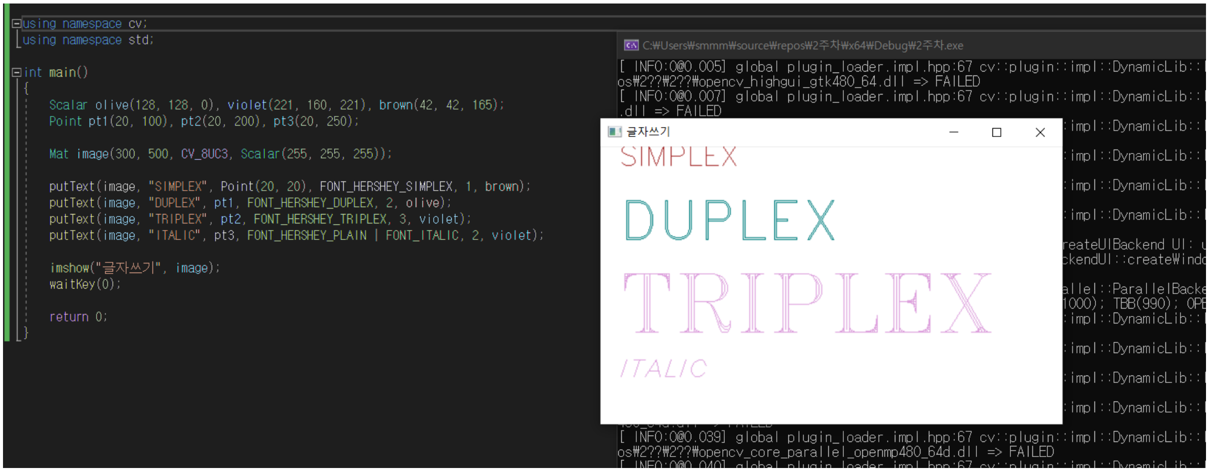


```cpp
#include <iostream>
#include <opencv2/opencv.hpp>

using namespace cv;
using namespace std;

void onMouse(int, int, int, int, void*);

int main()
{
    Mat image(200, 300, CV_8U);
    image.setTo(255);
    imshow("마우스 이벤트1", image);
    imshow("마우스 이벤트2", image);

    setMouseCallback("마우슨 이벤트1", onMouse, 0);
    waitKey(0);


    return 0;
}

void onMouse(int event, int x, int y, int flags, void * param)
{
    switch (event)
    {
    case EVENT_LBUTTONDOWN:
        cout << "마우스 왼쪽 버튼 누르기" << endl;
        break;
    case EVENT_RBUTTONDOWN:
        cout << "마우스 오른쪽 버튼 누르기" << endl;
        break;
    case EVENT_RBUTTONUP:
        cout << "마우스 오른쪽 버튼 떼기" << endl;
        break;
    case EVENT_LBUTTONUP:
        cout << "마우스 왼쪽 버튼 떼기" << endl;
        break;
    }
}
```



```
#include <iostream>
#include <opencv2/opencv.hpp>

using namespace cv;
using namespace std;


Mat image;
String title = "트랙바 이벤트";

void onChange(int value, void* userdata) {

    int add_value = value - 130;
    cout << "추가 화소값 " << add_value << endl;

    Mat tmp = image + add_value;
    imshow(title, tmp);

}

int main()
{

    int value = 128;
    image = Mat(300, 400, CV_8UC1, Scalar(120));

    namedWindow(title, WINDOW_AUTOSIZE);
    createTrackbar("밝기값", title, &value, 255, onChange);

    imshow(title, image);
    waitKey(0);

    return 0;
}
```

```
C:₩Users₩smmm₩source₩repos₩2주차₩x64₩Debug₩2주차.exe
추가 화소값 -31
추가 화소값 -36
추가 화소값 -40
```



```
using namespace cv;
using namespace std;

int main()
{
    Scalar olive(128, 128, 0), violet(221, 160, 221), brown(42, 42, 165);
    Point pt1(20, 100), pt2(20, 200), pt3(20, 250);

    Mat image(300, 500, CV_8UC3, Scalar(255, 255, 255));

    putText(image, "SIMPLEX", Point(20, 20), FONT_HERSHEY_SIMPLEX, 1, brown);
    putText(image, "DUPLEX", pt1, FONT_HERSHEY_DUPLEX, 2, olive);
    putText(image, "TRIPLEX", pt2, FONT_HERSHEY_TRIPLEX, 3, violet);
    putText(image, "ITALIC", pt3, FONT_HERSHEY_PLAIN | FONT_ITALIC, 2, violet);

    imshow("글자쓰기", image);
    waitKey(0);

    return 0;
}
```

```
C:₩Users₩smmm₩source₩repos₩2주차₩x64₩Debug₩2주차.exe
[ INFO:0@0.005] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::
os₩2??₩2??₩opencv_highgui_gtk480_64.dll => FAILED
[ INFO:0@0.007] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::
.dll => FAILED
                                                 :impl::DynamicLib::
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                                                 :impl::DynamicLib::
                                                 :impl::DynamicLib::
[ INFO:0@0.039] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::
os₩2??₩2??₩opencv_core_parallel_openmp480_64d.dll => FAILED
```

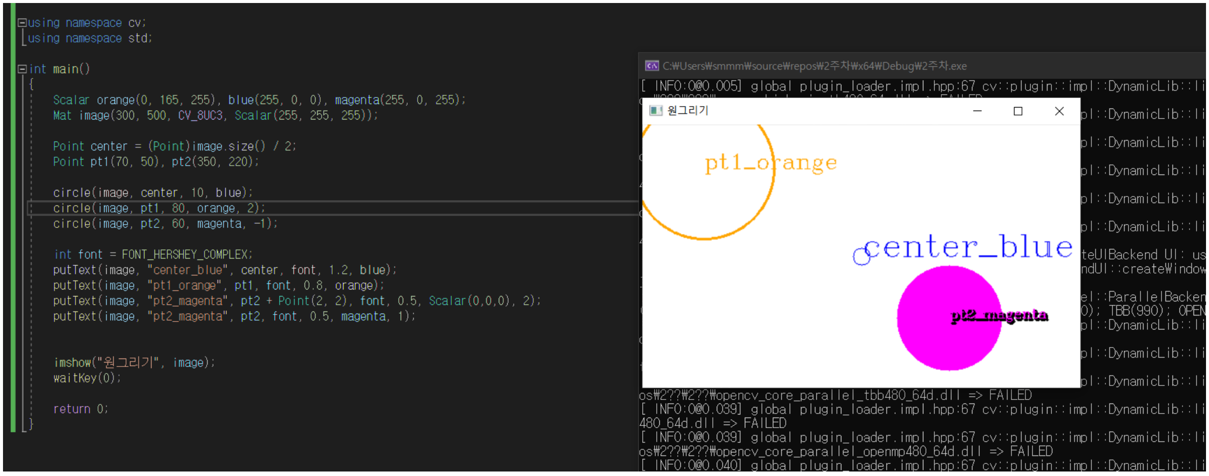

```
using namespace cv;
using namespace std;

int main()
{
    Scalar orange(0, 165, 255), blue(255, 0, 0), magenta(255, 0, 255);
    Mat image(300, 500, CV_8UC3, Scalar(255, 255, 255));

    Point center = (Point)image.size() / 2;
    Point pt1(70, 50), pt2(350, 220);

    circle(image, center, 10, blue);
    circle(image, pt1, 80, orange, 2);
    circle(image, pt2, 60, magenta, -1);

    int font = FONT_HERSHEY_COMPLEX;
    putText(image, "center_blue", center, font, 1.2, blue);
    putText(image, "pt1_orange", pt1, font, 0.8, orange);
    putText(image, "pt2_magenta", pt2 + Point(2, 2), font, 0.5, Scalar(0,0,0), 2);
    putText(image, "pt2_magenta", pt2, font, 0.5, magenta, 1);


    imshow("원그리기", image);
    waitKey(0);

    return 0;
}
```

```
C:₩Users₩smmm₩source₩repos₩2주차₩x64₩Debug₩2주차.exe
[ INFO:0@0.005] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::li
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                                                   ndUI::createWindow
                                                   el::ParallelBacken
                                                   0); TBB(990); OPEN
                                                   pl::DynamicLib::li
                                                   pl::DynamicLib::li
                                                   pl::DynamicLib::li
os₩2??₩2??₩opencv_core_parallel_tbb480_64d.dll => FAILED
[ INFO:0@0.039] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::li
480_64d.dll => FAILED
[ INFO:0@0.039] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::li
os₩2??₩2??₩opencv_core_parallel_openmp480_64d.dll => FAILED
[ INFO:0@0.040] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::li
```
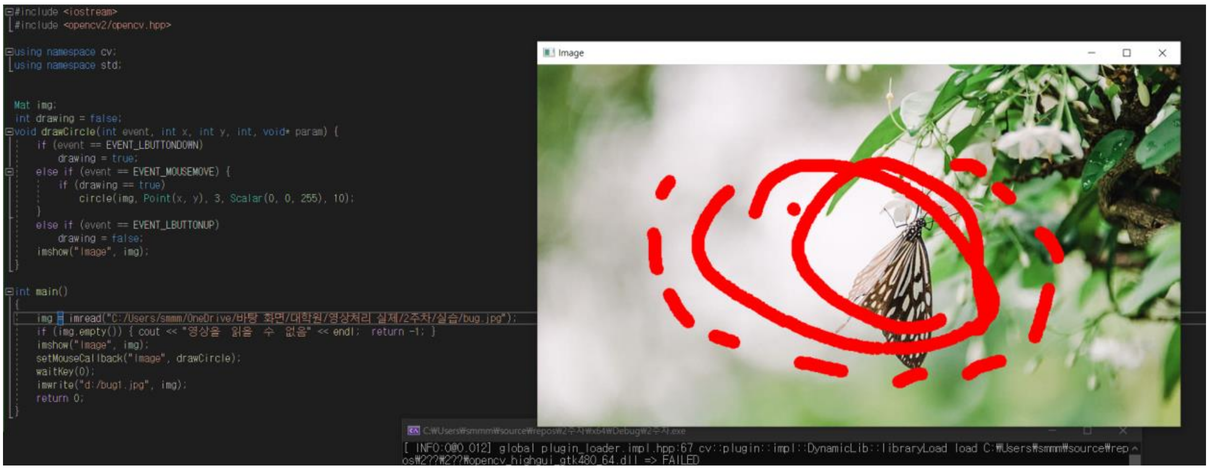
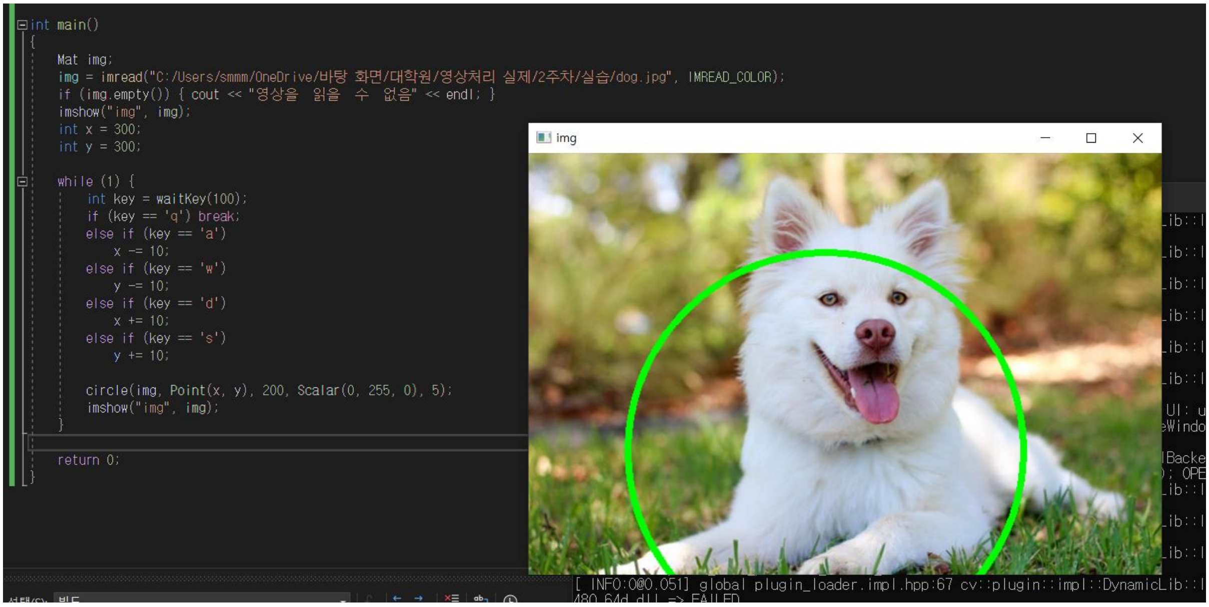



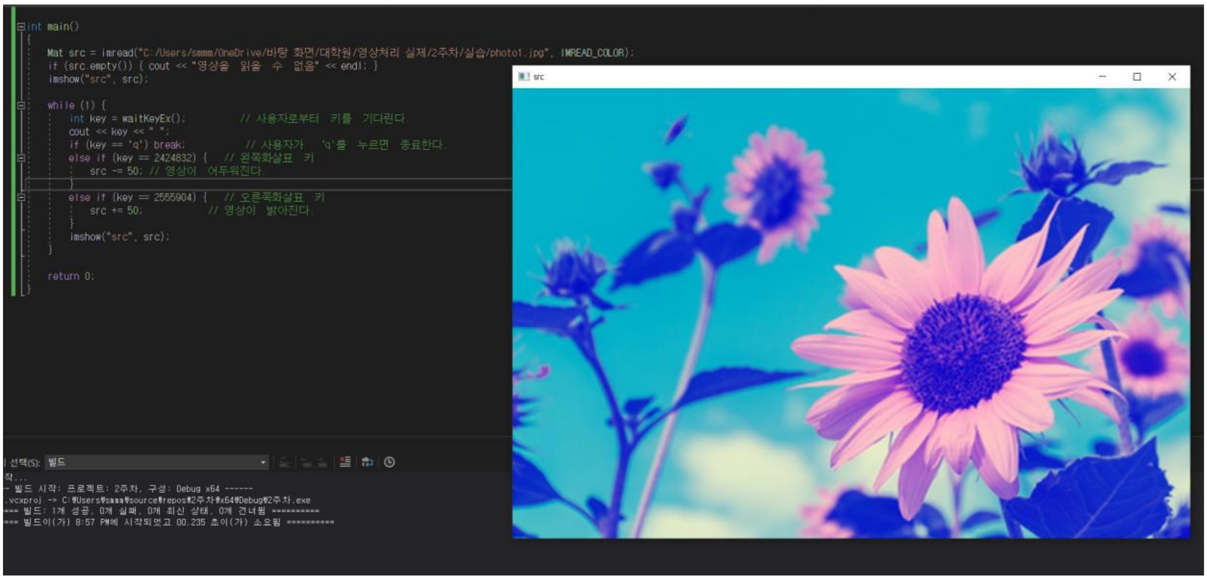
```
#include <iostream>
#include <opencv2/opencv.hpp>

using namespace cv;
using namespace std;


Mat img;
int drawing = false;
void drawCircle(int event, int x, int y, int, void* param) {
    if (event == EVENT_LBUTTONDOWN)
        drawing = true;
    else if (event == EVENT_MOUSEMOVE) {
        if (drawing == true)
            circle(img, Point(x, y), 3, Scalar(0, 0, 255), 10);
    }
    else if (event == EVENT_LBUTTONUP)
        drawing = false;
    imshow("Image", img);
}

int main()
{
    img = imread("C:/Users/smmm/OneDrive/바탕 화면/대학원/영상처리 실제/2주차/실습/bug.jpg");
    if (img.empty()) { cout << "영상을  읽을  수  없음" << endl;  return -1; }
    imshow("Image", img);
    setMouseCallback("Image", drawCircle);
    waitKey(0);
    imwrite("d:/bug1.jpg", img);
    return 0;
}
```

```
C:\Users\smmm\source\repos\2주차\x64\Debug\2주차.exe
[ INFO:0@0.012] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::libraryLoad load C:\Users\smmm\source\rep
os\2??\2??\opencv_highgui_gtk480_64.dll => FAILED
```



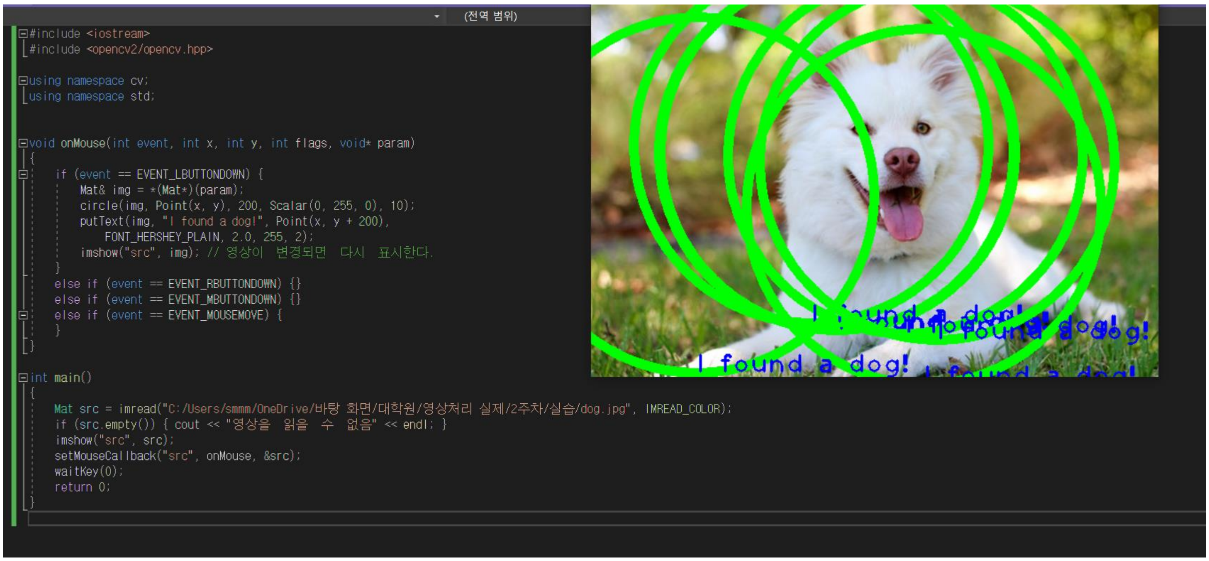
```
int main()
{
    Mat img;
    img = imread("C:/Users/smmm/OneDrive/바탕 화면/대학원/영상처리 실제/2주차/실습/dog.jpg", IMREAD_COLOR);
    if (img.empty()) { cout << "영상을  읽을  수  없음" << endl; }
    imshow("img", img);
    int x = 300;
    int y = 300;

    while (1) {
        int key = waitKey(100);
        if (key == 'q') break;
        else if (key == 'a')
            x -= 10;
        else if (key == 'w')
            y -= 10;
        else if (key == 'd')
            x += 10;
        else if (key == 's')
            y += 10;

        circle(img, Point(x, y), 200, Scalar(0, 255, 0), 5);
        imshow("img", img);
    }

    return 0;
}
```

```
[ INFO:0@0.051] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::l
480_64d.dll => FAILED
```

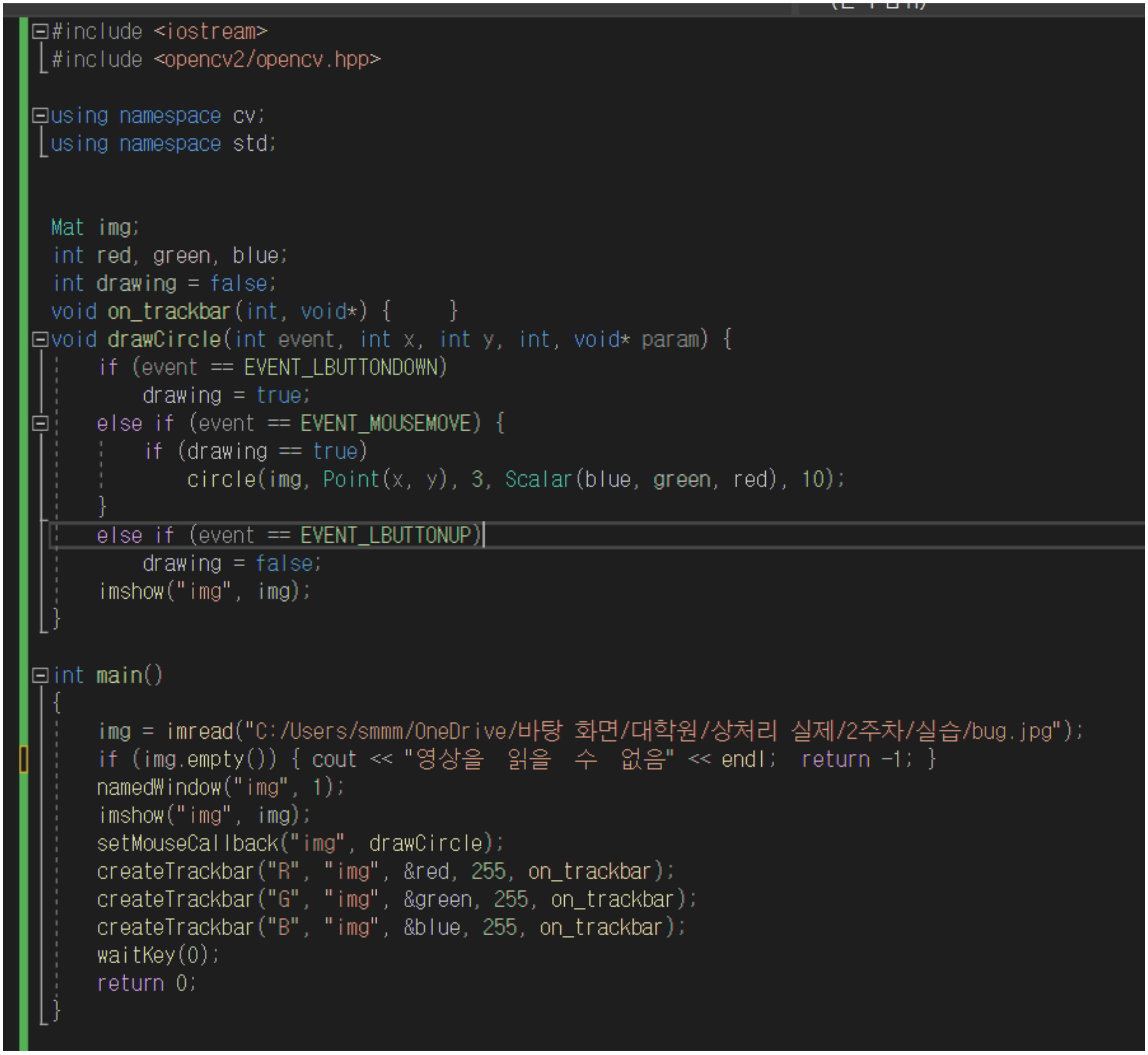


```
int main()
{
    Mat src = imread("C:/Users/smmm/OneDrive/바탕 화면/대학원/영상처리 실제/2주차/실습/photo1.jpg", IMREAD_COLOR);
    if (src.empty()) { cout << "영상을  읽을  수  없음" << endl; }
    imshow("src", src);

    while (1) {
        int key = waitKeyEx();          // 사용자로부터  키를  기다린다.
        cout << key << " ";
        if (key == 'q') break;           // 사용자가  'q'를  누르면  종료한다.
        else if (key == 2424832) {   // 왼쪽화살표  키
            src -= 50; // 영상이  어두워진다.
        }
        else if (key == 2555904) {   // 오른쪽화살표  키
            src += 50;            // 영상이  밝아진다.
        }
        imshow("src", src);
    }

    return 0;
}
```

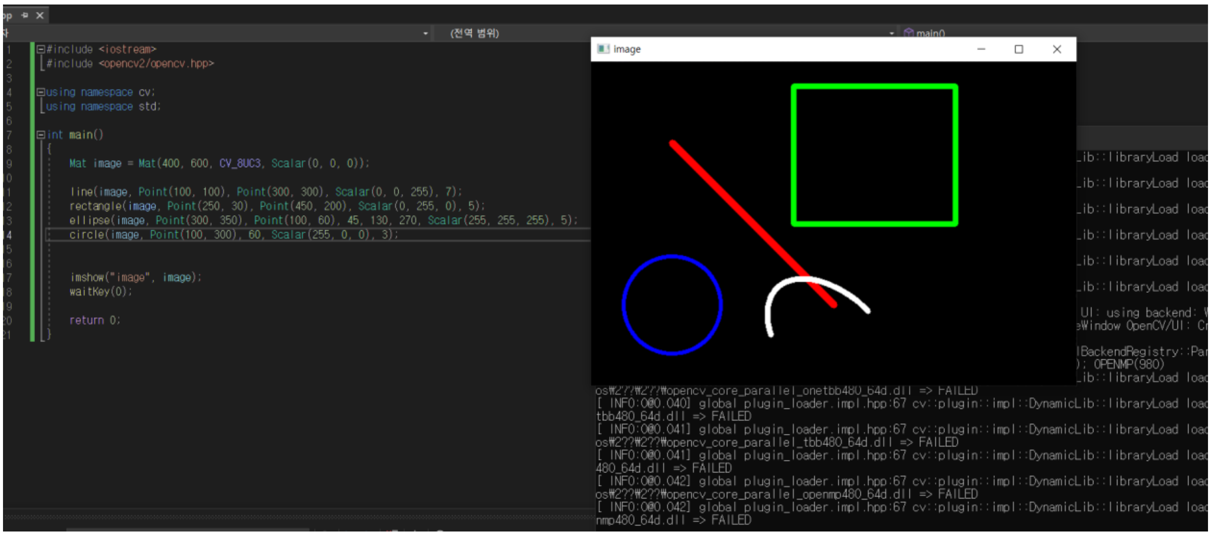
```
작...
-- 빌드 시작: 프로젝트: 2주차, 구성: Debug x64 ------
.vcxproj -> C:\Users\smmm\source\repos\2주차\x64\Debug\2주차.exe
=== 빌드: 1개 성공, 0개 실패, 0개 최신 상태, 0개 건너뜀 ==========
=== 빌드이(가) 8:57 PM에 시작되었고 00.235 초이(가) 소요됨 ==========
```



```cpp
#include <iostream>
#include <opencv2/opencv.hpp>

using namespace cv;
using namespace std;


void onMouse(int event, int x, int y, int flags, void* param)
{
    if (event == EVENT_LBUTTONDOWN) {
        Mat& img = *(Mat*)(param);
        circle(img, Point(x, y), 200, Scalar(0, 255, 0), 10);
        putText(img, "I found a dog!", Point(x, y + 200),
            FONT_HERSHEY_PLAIN, 2.0, 255, 2);
        imshow("src", img); // 영상이  변경되면  다시  표시한다.
    }
    else if (event == EVENT_RBUTTONDOWN) {}
    else if (event == EVENT_MBUTTONDOWN) {}
    else if (event == EVENT_MOUSEMOVE) {
    }
}

int main()
{
    Mat src = imread("C:/Users/smmm/OneDrive/바탕 화면/대학원/영상처리 실제/2주차/실습/dog.jpg", IMREAD_COLOR);
    if (src.empty()) { cout << "영상을  읽을  수  없음" << endl; }
    imshow("src", src);
    setMouseCallback("src", onMouse, &src);
    waitKey(0);
    return 0;
}
```



```cpp
#include <iostream>
#include <opencv2/opencv.hpp>

using namespace cv;
using namespace std;


Mat img;
int red, green, blue;
int drawing = false;
void on_trackbar(int, void*) {      }
void drawCircle(int event, int x, int y, int, void* param) {
    if (event == EVENT_LBUTTONDOWN)
        drawing = true;
    else if (event == EVENT_MOUSEMOVE) {
        if (drawing == true)
            circle(img, Point(x, y), 3, Scalar(blue, green, red), 10);
    }
    else if (event == EVENT_LBUTTONUP)
        drawing = false;
    imshow("img", img);
}

int main()
{
    img = imread("C:/Users/smmm/OneDrive/바탕 화면/대학원/상처리 실제/2주차/실습/bug.jpg");
    if (img.empty()) { cout << "영상을  읽을  수  없음" << endl;  return -1; }
    namedWindow("img", 1);
    imshow("img", img);
    setMouseCallback("img", drawCircle);
    createTrackbar("R", "img", &red, 255, on_trackbar);
    createTrackbar("G", "img", &green, 255, on_trackbar);
    createTrackbar("B", "img", &blue, 255, on_trackbar);
    waitKey(0);
    return 0;
}
```



```cpp
#include <iostream>
#include <opencv2/opencv.hpp>

using namespace cv;
using namespace std;

int main()
{
    Mat image = Mat(400, 600, CV_8UC3, Scalar(0, 0, 0));

    line(image, Point(100, 100), Point(300, 300), Scalar(0, 0, 255), 7);
    rectangle(image, Point(250, 30), Point(450, 200), Scalar(0, 255, 0), 5);
    ellipse(image, Point(300, 350), Point(100, 60), 45, 130, 270, Scalar(255, 255, 255), 5);
    circle(image, Point(100, 300), 60, Scalar(255, 0, 0), 3);


    imshow("image", image);
    waitKey(0);

    return 0;
}
```

```
Lib::libraryLoad load
Lib::libraryLoad load
Lib::libraryLoad load
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Lib::libraryLoad load
Lib::libraryLoad load
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eWindow OpenCV/UI: Cr
lBackendRegistry::Par
): OPENMP(980)
Lib::libraryLoad load
os₩2??₩2??₩opencv_core_parallel_onetbb480_64d.dll => FAILED
[ INFO:0@0.040] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::libraryLoad load
tbb480_64d.dll => FAILED
[ INFO:0@0.041] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::libraryLoad load
os₩2??₩2??₩opencv_core_parallel_tbb480_64d.dll => FAILED
[ INFO:0@0.041] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::libraryLoad load
480_64d.dll => FAILED
[ INFO:0@0.042] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::libraryLoad load
os₩2??₩2??₩opencv_core_parallel_openmp480_64d.dll => FAILED
[ INFO:0@0.042] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::libraryLoad load
nmp480_64d.dll => FAILED
```

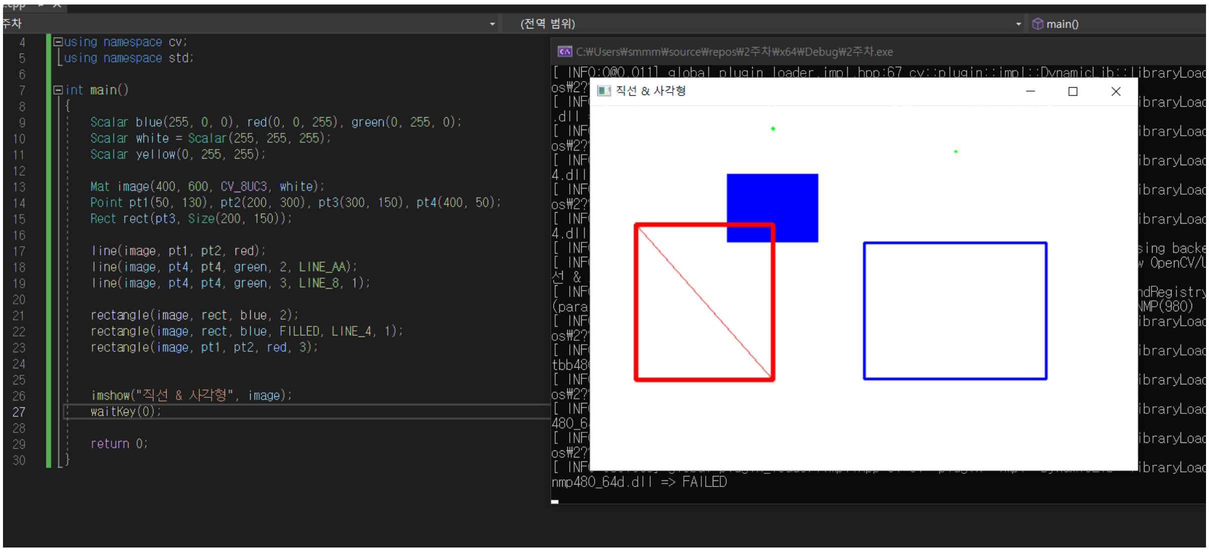

```cpp
using namespace cv;
using namespace std;

int main()
{
    Scalar blue(255, 0, 0), red(0, 0, 255), green(0, 255, 0);
    Scalar white = Scalar(255, 255, 255);
    Scalar yellow(0, 255, 255);

    Mat image(400, 600, CV_8UC3, white);
    Point pt1(50, 130), pt2(200, 300), pt3(300, 150), pt4(400, 50);
    Rect rect(pt3, Size(200, 150));

    line(image, pt1, pt2, red);
    line(image, pt4, pt4, green, 2, LINE_AA);
    line(image, pt4, pt4, green, 3, LINE_8, 1);

    rectangle(image, rect, blue, 2);
    rectangle(image, rect, blue, FILLED, LINE_4, 1);
    rectangle(image, pt1, pt2, red, 3);


    imshow("직선 & 사각형", image);
    waitKey(0);

    return 0;
}
```

C:₩Users₩smmm₩source₩repos₩2주차₩x64₩Debug₩2주차.exe

```
[ INFO:0@0.011] global plugin_loader.impl.hpp:67 cv::plugin::impl::DynamicLib::libraryLoad
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[ INF                                                          ibraryLoad
480_6
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os₩2?
[ INF                                                          ibraryLoad
nmp480_64d.dll => FAILED
```