

Visual Studio Code interface showing the source code for `9주차_13_16page.cpp`. The code implements a color conversion function `bgr2hsl` and a `main` function that reads an image, converts it to HSL, and displays the results.

```

1  #include <opencv2/opencv.hpp>
2  using namespace cv;
3  using namespace std;
4
5  void bgr2hsl(Mat img, Mat& hsl)
6  {
7      hsl = Mat(img.size(), CV_32FC3);
8      for (int i = 0; i < img.rows; i++) {
9          for (int j = 0; j < img.cols; j++) {
10             float B = img.at<Vec3b>(i, j)[0];
11             float G = img.at<Vec3b>(i, j)[1];
12             float R = img.at<Vec3b>(i, j)[2];
13
14             float s = 1 - 3 * min(R, min(G, B)) / (R + B + G);
15             float v = (R + G + B) / 3.0f;
16
17             float tmp1 = ((R - G) + (R - B)) * 0.5f;
18             float tmp2 = sqrt((R - G) * (R - B) + (G - B) * (G - R));
19             float angle = acos(tmp1 / tmp2) * (180.f / CV_PI);
20             float h = (B <= G) ? angle : 360 - angle;
21
22             hsl.at<Vec3f>(i, j) = Vec3f(h / 2, s + 255, v);
23         }
24     }
25 }
26
27 int main()
28 {
29     Mat BGR_img = imread("C:/Users/Chan's Victus/Documents/class/Project/image/color.jpg");
30     CV_Assert(BGR_img.data);
31     Mat HSL_img, HSV_img, hsl[3], hsv[3];
32
33     bgr2hsl(BGR_img, HSL_img);
34     cvtColor(BGR_img, HSV_img, COLOR_BGR2HSV);
35     split(HSL_img, hsl);
36     split(HSV_img, hsv);
37
38     imshow("BGR_img", BGR_img);
39     imshow("Hue", hsl[0]);
40     imshow("Saturation", hsl[1]);
41     imshow("Intensity", hsl[2]);
42     imshow("OpenCV_Hue", hsv[0]);
43     imshow("OpenCV_Saturation", hsv[1]);
44     imshow("OpenCV_Value", hsv[2]);
45     waitKey();
46     return 0;
47 }

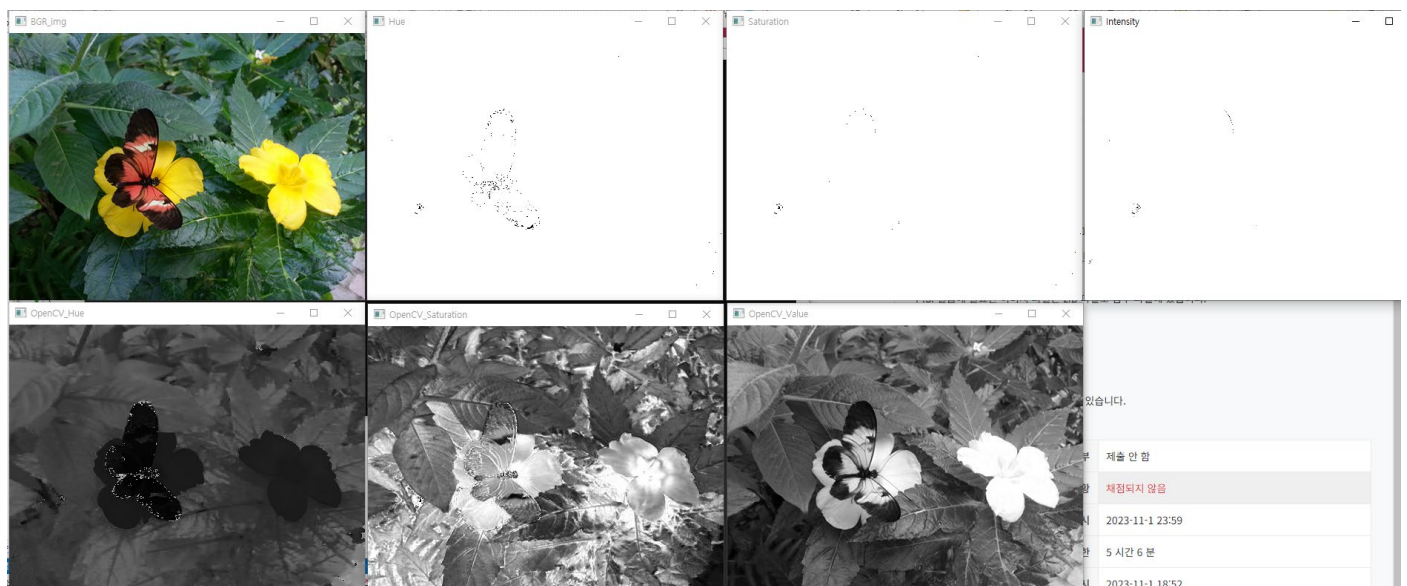
```

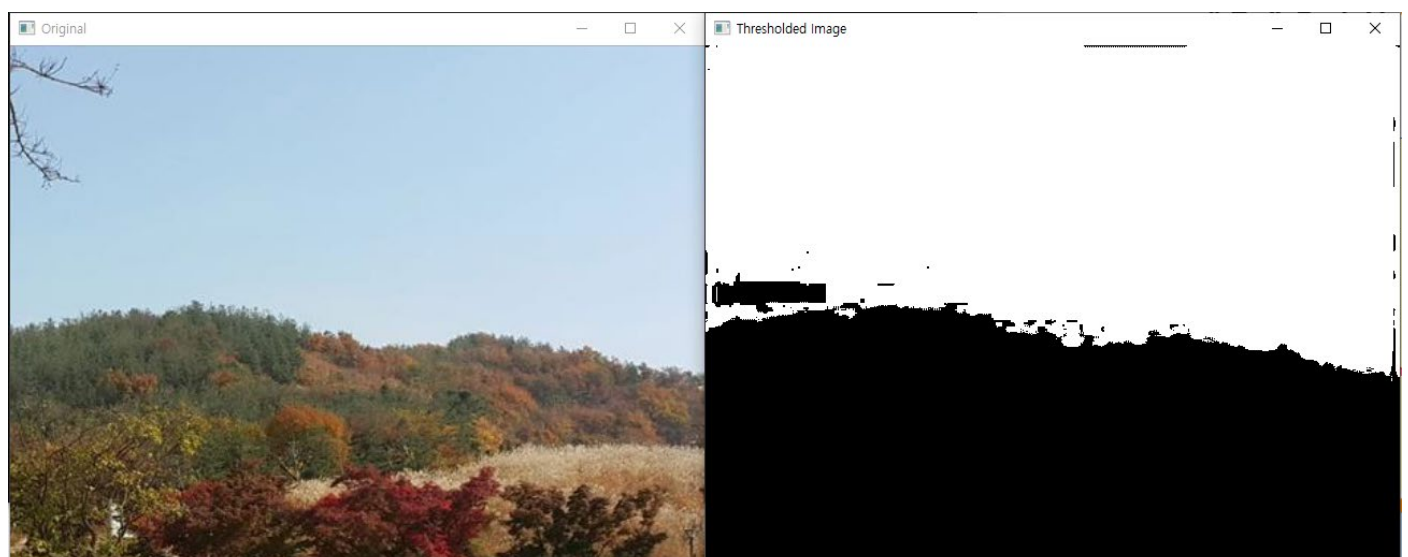
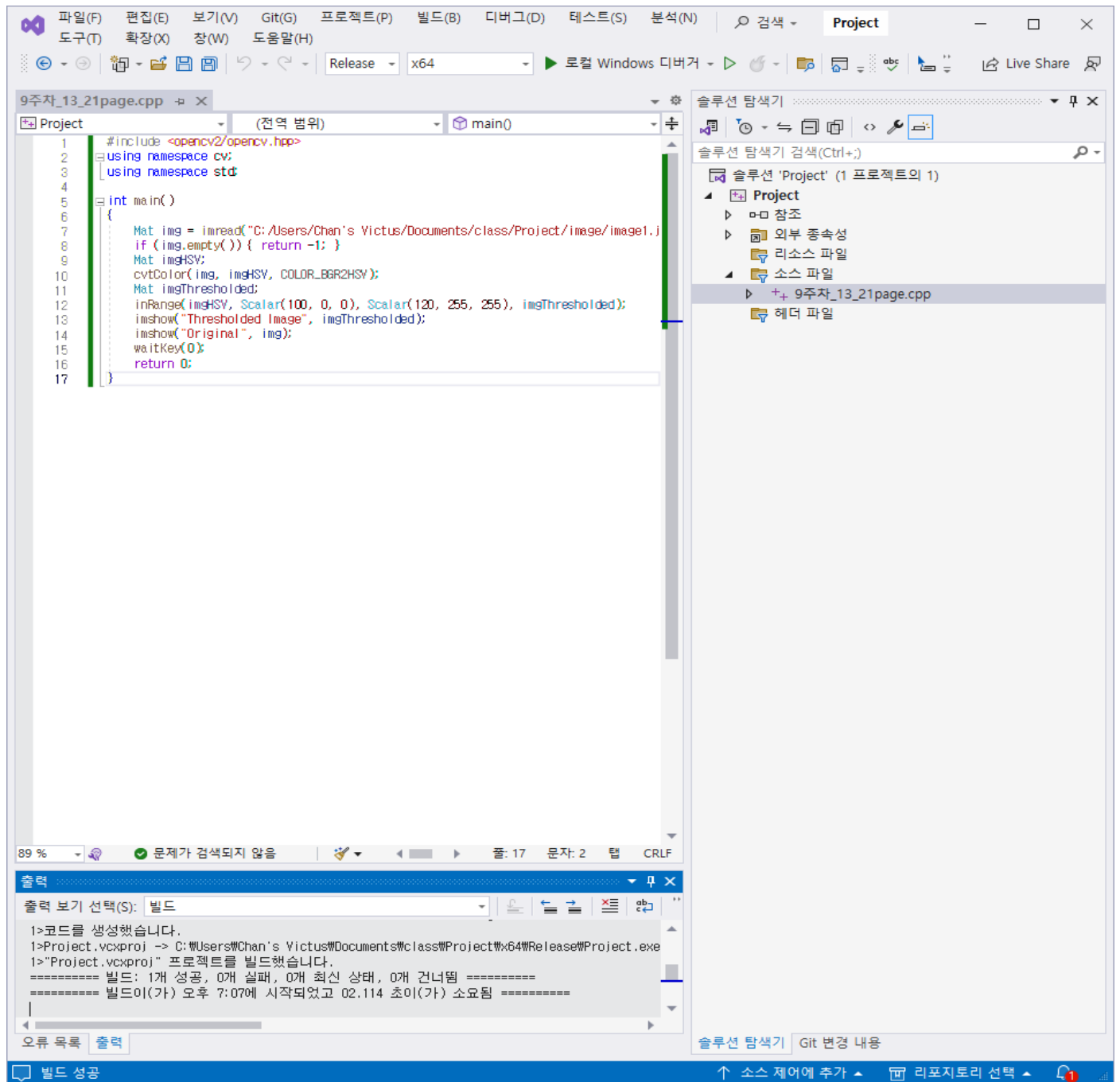
The output window shows the build process:

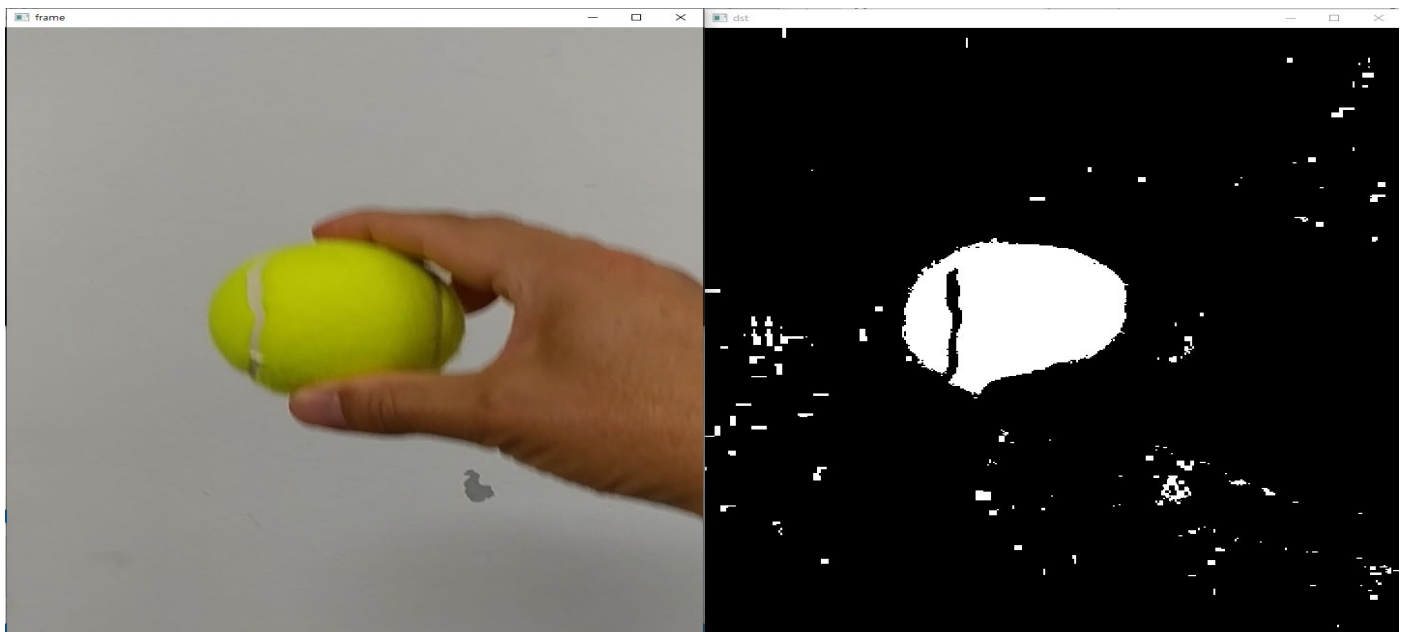
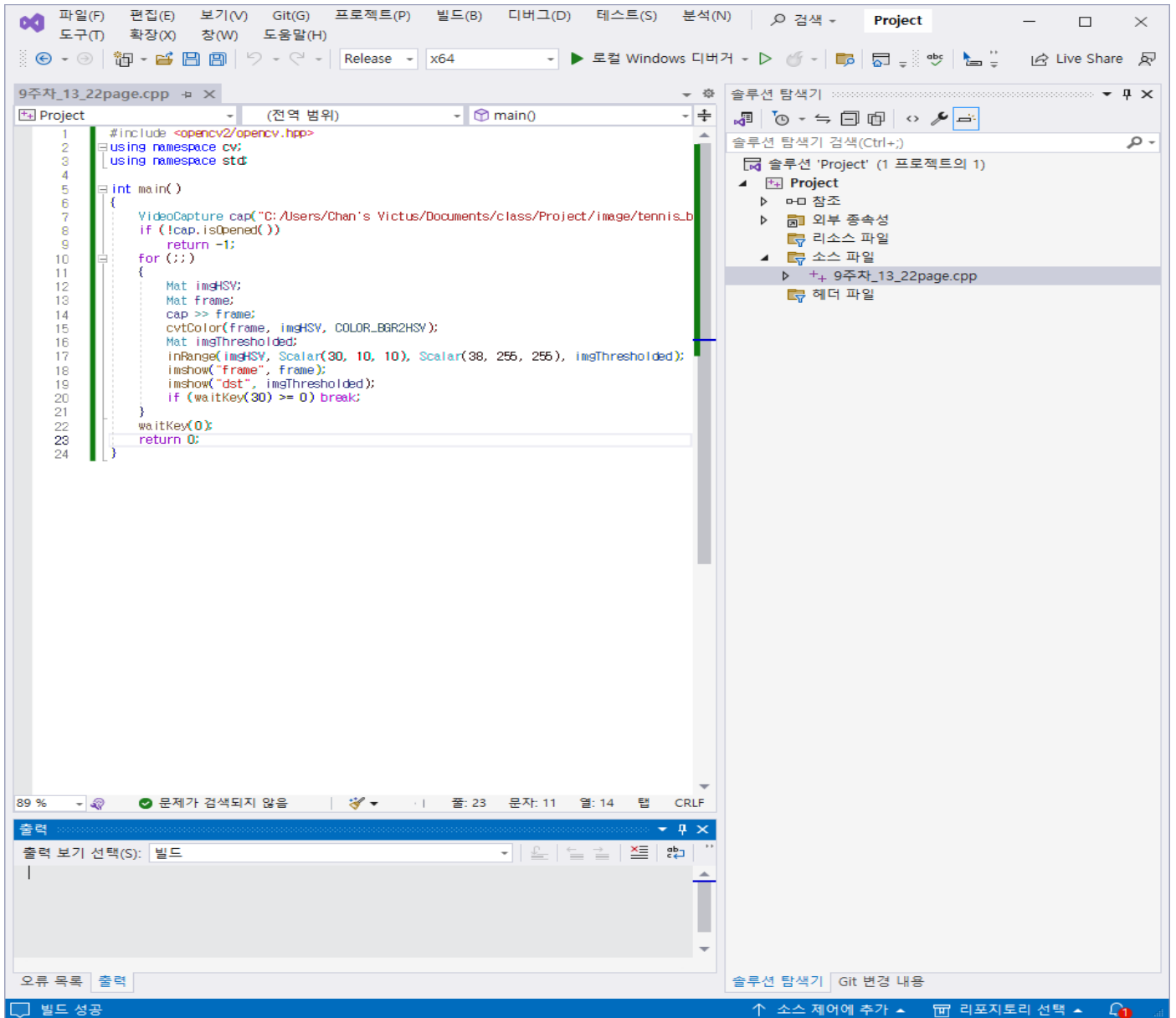
```

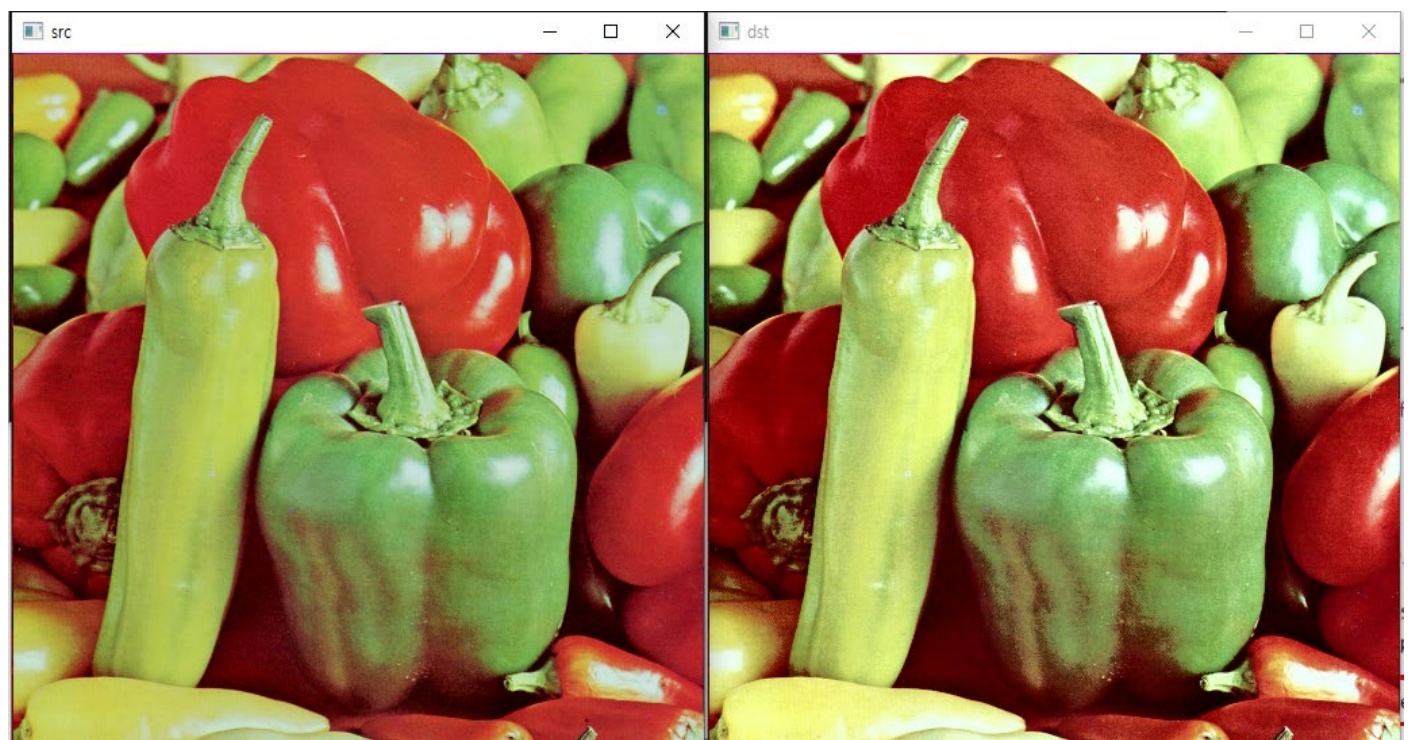
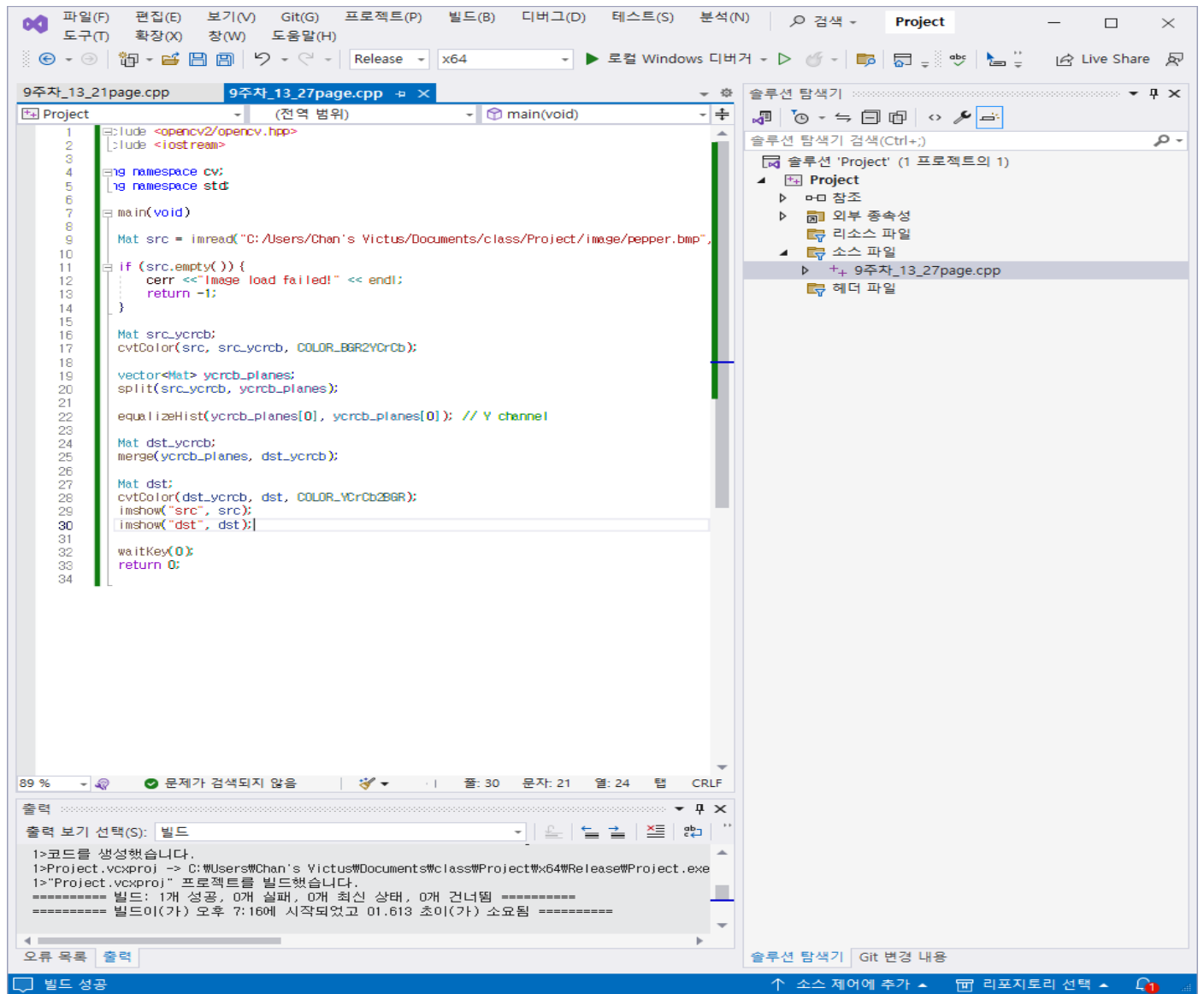
출력 보기 선택(S): 빌드
1>코드를 생성했습니다.
1>Project.vcxproj -> C:\Users\Chan's Victus\Documents\class\Project\x64\Release\Project.exe
1>"Project.vcxproj" 프로젝트를 빌드했습니다.
===== 빌드: 1개 성공, 0개 실패, 0개 최신 상태, 0개 건너뛴 =====
===== 빌드이(가) 오후 7:04에 시작되었고 01.785 초이(가) 소요됨 =====

```

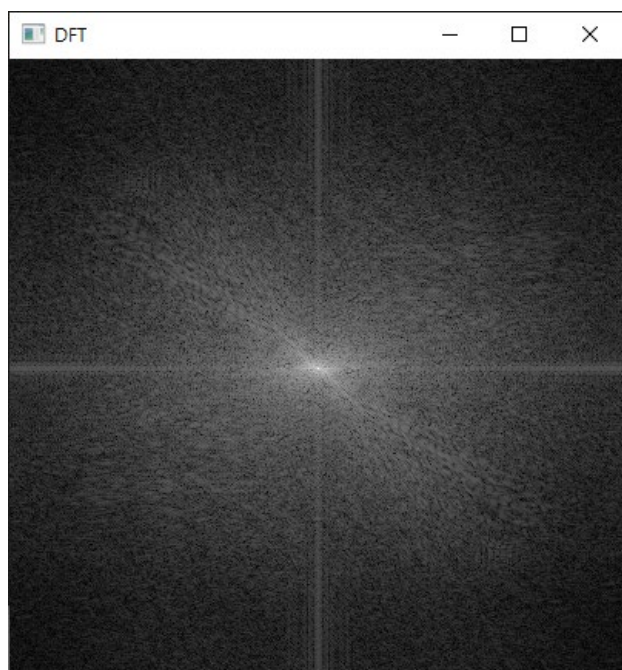
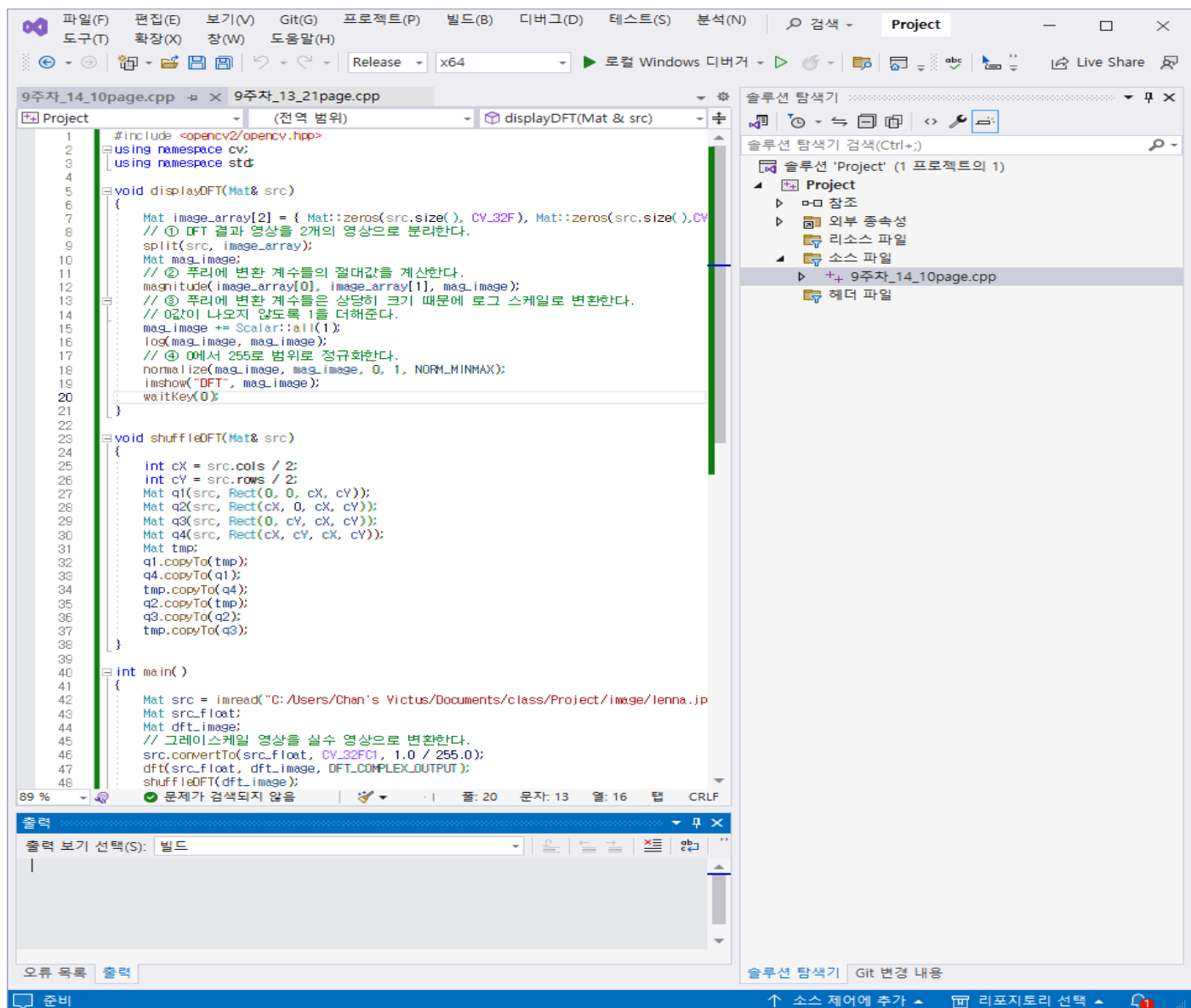












Visual Studio IDE showing the source code for '9주차\_14\_12page.cpp' and the output of the build process.

```

7  Mat image_array[2] = { Mat::zeros(src.size(), CV_32F), Mat::zeros(src.size(), CV_32F) };
8  // ① DFT 결과 영상을 2개의 영상으로 분리한다.
9  split(src, image_array);
10 Mat mag_image;
11 // ② 푸리에 변환 계수들의 절대값을 계산한다.
12 magnitude(image_array[0], image_array[1], mag_image);
13 // ③ 푸리에 변환 계수들은 상당히 크기 때문에 로그 스케일로 변환한다.
14 // 0값이 나오지 않도록 1을 더해준다.
15 mag_image += Scalar::all(1);
16 log(mag_image, mag_image);
17 // ④ 0에서 255로 범위로 정규화한다.
18 normalize(mag_image, mag_image, 0, 1, NORM_MINMAX);
19 imshow("DFT", mag_image);
20 waitKey(0);
21 }
22
23 void shuffledFT(Mat& src)
24 {
25     int cx = src.cols / 2;
26     int cy = src.rows / 2;
27     Mat q1(src, Rect(0, 0, cx, cy));
28     Mat q2(src, Rect(cx, 0, cx, cy));
29     Mat q3(src, Rect(0, cy, cx, cy));
30     Mat q4(src, Rect(cx, cy, cx, cy));
31     Mat tmp;
32     q1.copyTo(tmp);
33     q4.copyTo(q1);
34     tmp.copyTo(q4);
35     q2.copyTo(tmp);
36     q3.copyTo(q2);
37     tmp.copyTo(q3);
38 }
39
40 int main()
41 {
42     Mat img = imread("C:/Users/Chan's Victus/Documents/class/Project/image/lenna.jpg");
43     Mat img_float, dft1, inversedft, inversedft1;
44     img.convertTo(img_float, CV_32F);
45     dft(img_float, dft1, DFT_COMPLEX_OUTPUT);
46     // 역변환을 수행한다.
47     idft(dft1, inversedft, DFT_SCALE | DFT_REAL_OUTPUT);
48     inversedft.convertTo(inversedft1, CV_8U);
49     imshow("inversedft", inversedft1);
50     imshow("original", img);
51     waitKey(0);
52     return 0;
53 }

```

Build Output:

```

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
===== 빌드: 1개 성공, 0개 실패, 0개 최신 상태, 0개 건너뛴 =====
===== 빌드이(가) 오후 7:25에 시작되었고 00.591 초이(가) 소요됨 =====

```