
주간 보고

Finger Keyboard – Open CV



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지난 주 한 일



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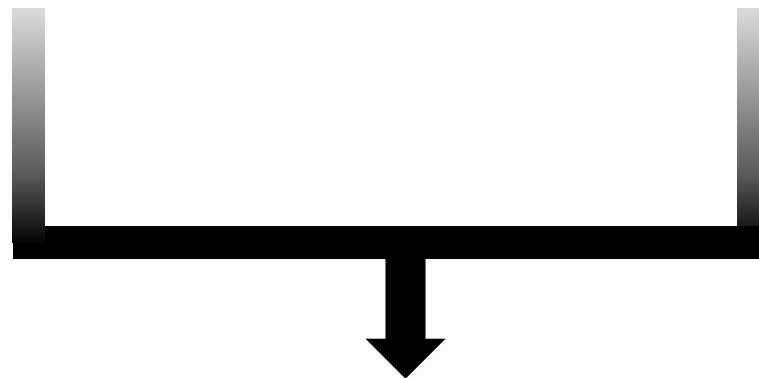


Camera Calibration



**Intrinsic
Parameter**

**Extrinsic
Parameter**

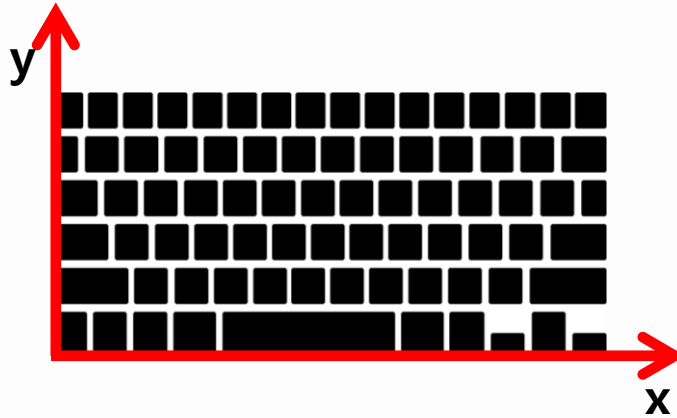


- **radial distortion**
- **tangential distortion**



01 - 1

Camera Calibration



- world Coordinate

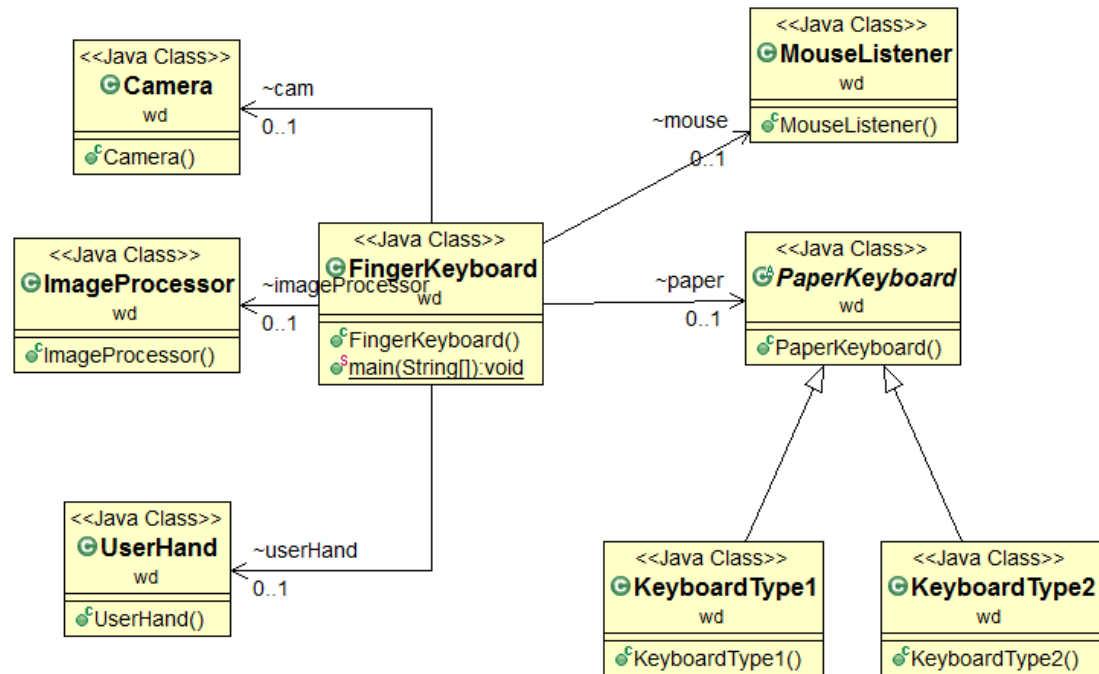


- Image Coordinate



Code Refactoring

- Class Diagram



01 - 3

Finger Tip Detection



Open CV

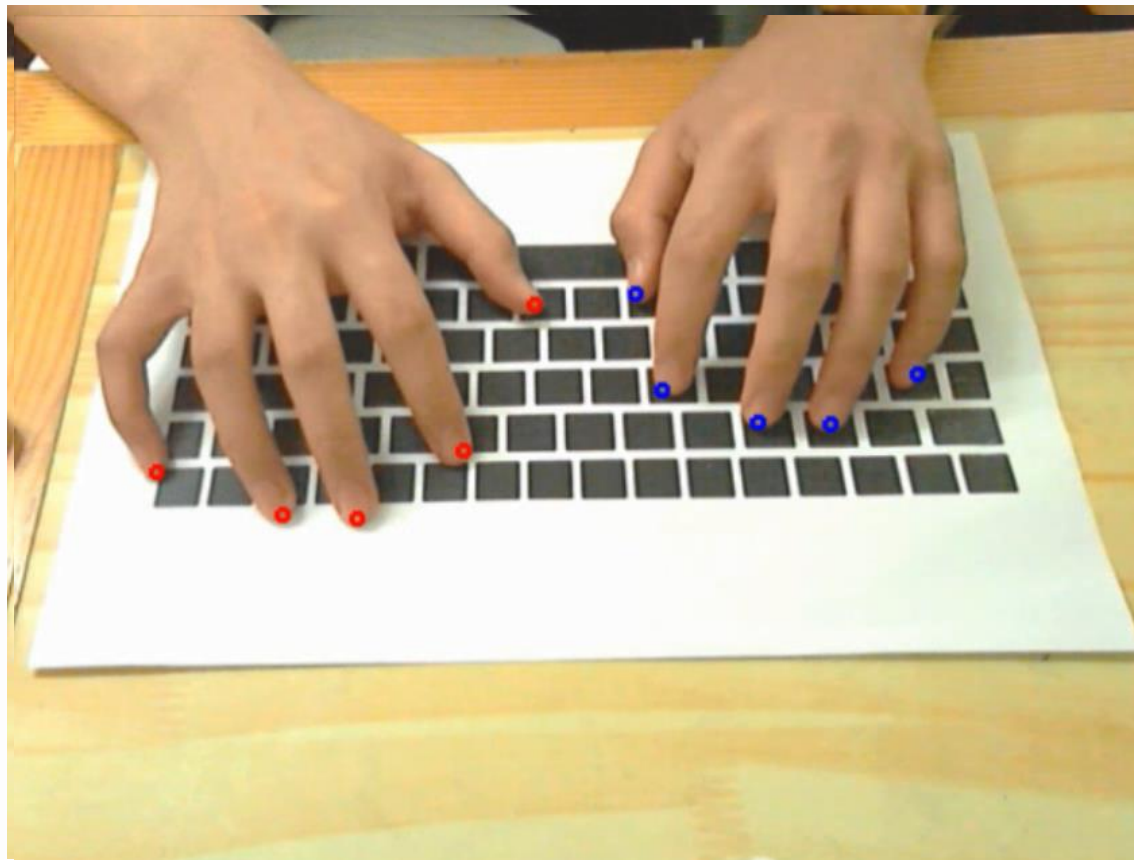


Binary Image

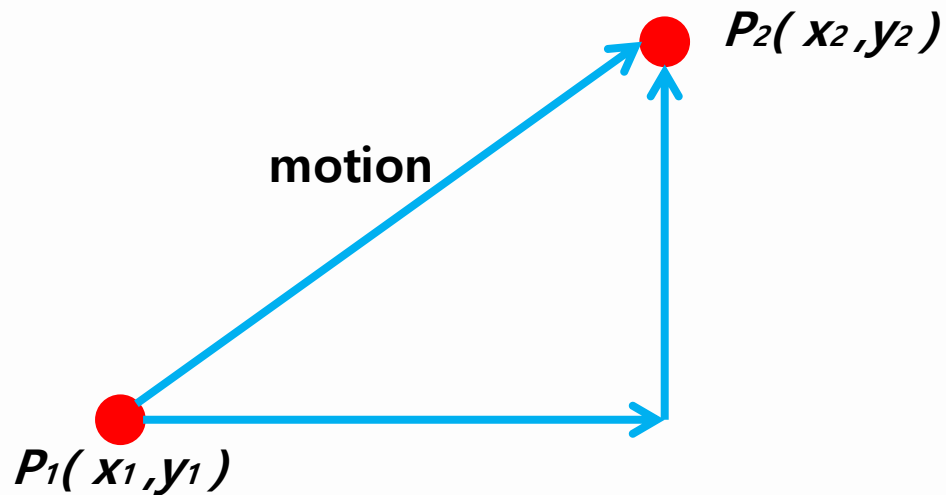


01 - 3

Finger Tip Detection



Motion Vector



`graph[finger][frame] = motion`



01 - 4

Motion Vector - Frame

```

// PaperKeyboard.cpp
73 for(int i = 0 ; i < 4 ; i++){
74     for(int j = 0 ; j < 3 - i ; j++){
75         if(FingerKeyboard::keyboardCorner[j].y > FingerKeyboard::keyboardCorner[j+1].y){
76             temp = FingerKeyboard::keyboardCorner[j];
77             FingerKeyboard::keyboardCorner[j] = FingerKeyboard::keyboardCorner[j+1];
78             FingerKeyboard::keyboardCorner[j+1] = temp;
79         }
80     }
81 }
82 for(int i = 0 ; i < 2 ; i++){
83     for(int j = 0 ; j < 1 - i ; j++){
84         if(FingerKeyboard::keyboardCorner[j].x > FingerKeyboard::keyboardCorner[j+1].x){
85             temp = FingerKeyboard::keyboardCorner[j];
86             FingerKeyboard::keyboardCorner[j] = FingerKeyboard::keyboardCorner[j+1];
87             FingerKeyboard::keyboardCorner[j+1] = temp;
88         }
89     }
90 }
91 for(int i = 0 ; i < 2 ; i++){
92     for(int j = 0 ; j < 1 - i ; j++){
93         if(FingerKeyboard::keyboardCorner[j+2].x < FingerKeyboard::keyboardCorner[j+3].x){
94             temp = FingerKeyboard::keyboardCorner[j+2];
95             FingerKeyboard::keyboardCorner[j+2] = FingerKeyboard::keyboardCorner[j+3];
96             FingerKeyboard::keyboardCorner[j+3] = temp;
97         }
98     }
99 }
100 }
101 }
102 void ImageProcessor::cornerSortingX(int startIndex, int cornerCount){
// ImageProcessor.cpp
56 static CvPoint fingertip[2][5];
57 static CvPoint prevFingerTip[2][5];
58 static CvSize size;
59 static IplImage* showGraph;
60 static CvPoint prevPoint;
61 static double motionAvg;
62 static double motionSum;
63 static bool downOrientation;
64 static double graph[10000];
65 void paperAreaDraggingImage(IplImage* srcImage);
66 void getPaperKeyboardCorner(IplImage* srcImage, CvPoint2D32f* corners);
67 void setCorner();
68 void getKeyButton(IplImage* srcImage);
69 void detectKeyButtonCorner(IplImage* srcImage);
70 void initKeyButtonCorner();
71 void setKeyButtonArea(CvPoint2D32f* corners, int startIndex, int cornerCount);
72 void setDirectionKeyButtonArea(CvPoint2D32f* corners, int startIndex, int cornerCount);
73 void cornerVerification(IplImage* srcImage);
74 void cornerSortingY(int startIndex, int cornerCount);
75 void cornerSortingX(int startIndex, int cornerCount);
76 void showKeyButton(IplImage* srcImage);
77 void cameraCalibration(IplImage* srcImage);
78 void createSkinColorHistogram(IplImage* srcImage);
79 void detectHandContour(IplImage* srcImage);
80 void determineFingerTip(int nomdef, int side);
81 void makeMotionGraph();
82 double calcMotionVector();
83 double calcMotionAvg(double motionVector);
84 bool isMotionVectorValid();
85 //int getOrder(int descendingOrder);

```



01 - 5

Key Event

The screenshot shows a Beamer presentation slide titled "01 - 5 Key Event". The slide features the OpenCV logo, which consists of three interlocking loops in red, green, and blue, with the text "Open CV" below it. The slide is displayed in a Beamer window with a sidebar on the left showing a list of slides (8, 9, 10, 11, 12, 13) and a toolbar at the top. The status bar at the bottom indicates "슬라이드 11/17", "Office 테마", and "한국어". A small eye icon is visible in the bottom right corner of the slide area.

여기에 슬라이드 노트의 내용을 입력하십시오



이번 주 한 일



Open CV

- 종이 키보드 설계
- 손 끝 추출 개선
- 이벤트 조건 개선
- 실제 키 발생



종이 키보드 설계

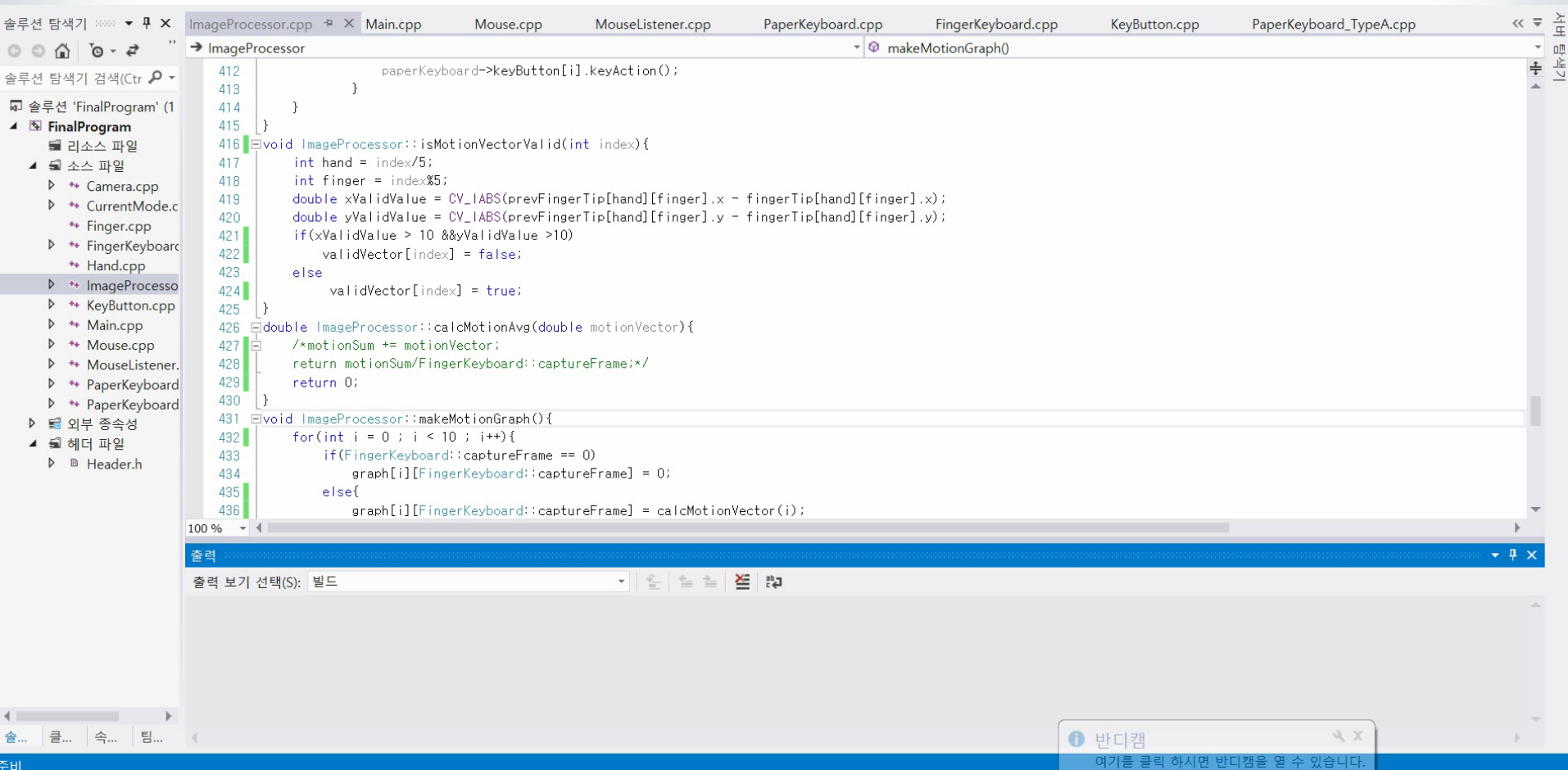


- 키 버튼 레이블



02 - 2

• 손 끝 추출 개선



The screenshot shows a C++ IDE with the following components:

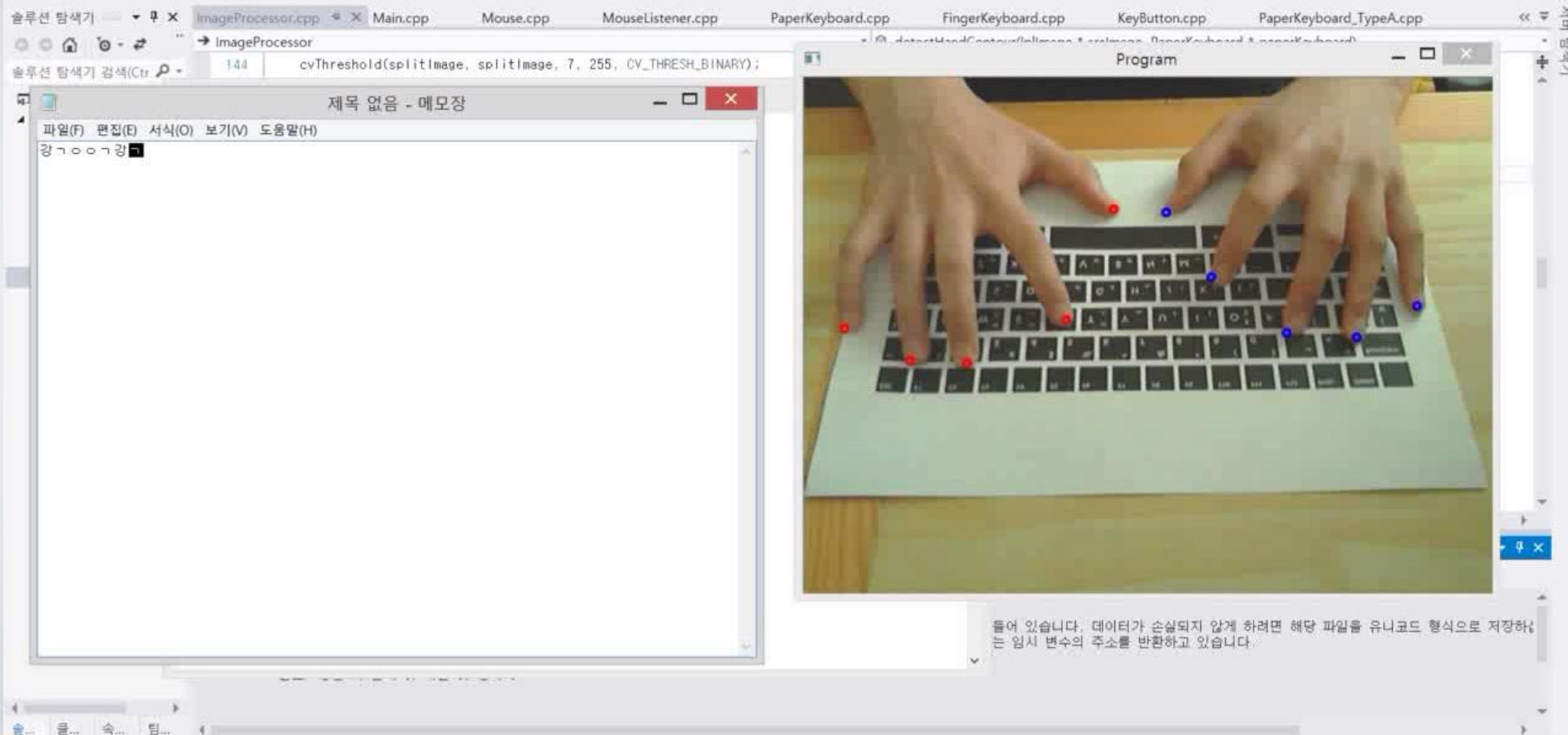
- File Explorer (Left):** Displays the project structure for 'FinalProgram'. It includes subfolders for '리소스 파일' (Resource Files) and '소스 파일' (Source Files). The '소스 파일' folder contains several C++ files: Camera.cpp, CurrentMode.c, Finger.cpp, FingerKeyboard.cpp, Hand.cpp, ImageProcesso, KeyButton.cpp, Main.cpp, Mouse.cpp, MouseListener.cpp, PaperKeyboard, and PaperKeyboard. The '외부 종속성' (External Dependencies) folder contains '헤더 파일' (Header Files) and 'Header.h'.
- Code Editor (Center):** Shows the code for 'ImageProcessor.cpp'. The code is as follows:

```
412         paperKeyboard->keyButton[i].keyAction();
413     }
414 }
415
416 void ImageProcessor::isMotionVectorValid(int index){
417     int hand = index/5;
418     int finger = index%5;
419     double xValidValue = CV_IABS(prevFingerTip[hand][finger].x - fingerTip[hand][finger].x);
420     double yValidValue = CV_IABS(prevFingerTip[hand][finger].y - fingerTip[hand][finger].y);
421     if(xValidValue > 10 &&yValidValue >10)
422         validVector[index] = false;
423     else
424         validVector[index] = true;
425 }
426 double ImageProcessor::calcMotionAvg(double motionVector){
427     /*motionSum += motionVector;
428     return motionSum/FingerKeyboard::captureFrame;*/
429     return 0;
430 }
431 void ImageProcessor::makeMotionGraph(){
432     for(int i = 0 ; i < 10 ; i++){
433         if(FingerKeyboard::captureFrame == 0)
434             graph[i][FingerKeyboard::captureFrame] = 0;
435         else{
436             graph[i][FingerKeyboard::captureFrame] = calcMotionVector(i);
```
- Output Window (Bottom):** Shows the output of the program. The text '출력 보기 선택(S): 빌드' (Select output view (S): Build) is displayed.
- Notification (Bottom Right):** A small notification bubble with a lightbulb icon and the text '반디캠' (Bandicam) and '여기를 클릭하시면 반디캠을 열 수 있습니다.' (Click here to open Bandicam).



02 - 3

• 이벤트 조건 개선, 실제 키 발생



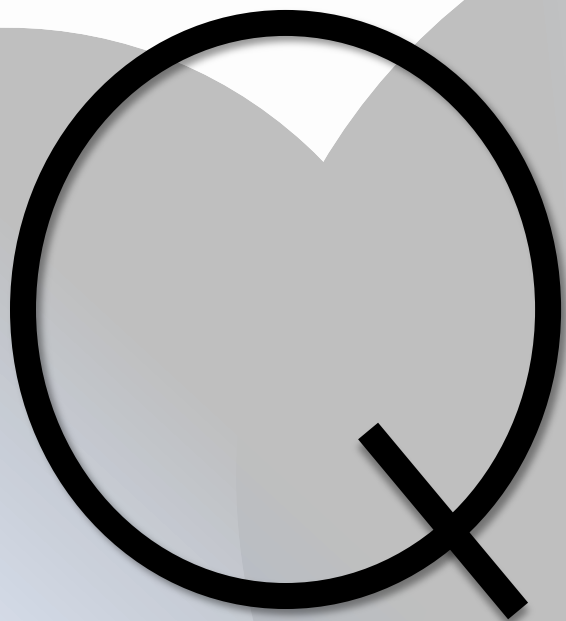
다음 주 한 일



Open CV

- 키 이벤트 처리 더욱 더 개선
- 키가 눌린 상태, 떴진 상태 고려





& A