

Lab 4

2018/3/29

1. Camera Calibration (50%)
2. Warping practice (50%)

1. Camera Calibration (50%)

How to get image from webcam?

- `VideoCapture cap(0); // 0: default device`
- ```
while(1) {
 Mat frame;
 cap >> frame;
 imshow("webcam", frame);
 waitKey(33);
}
```

# Find chessboard corners

- findChessboardCorners(  
    Mat& image,                         // gray-scale image  
    Size(COLS, ROWS),                  // chessboard size  
    vector<Point2f>& corners,          // output  
)
- cornerSubPix(  
    Mat& image,                         // gray-scale image  
    vector<Point2f>& corners,          // updated corners  
    Size(d, d),                         // window size  
    Size(-1, -1),  
    TermCriteria(TermCriteria::EPS | TermCriteria::COUNT, 30, 0.1)  
)

# Calibration Part 2.

## Get parameters by corners

- `calibrateCamera(  
    vector<Point3f>& pts3D,       // corresponding points in 3D  
    vector<Point2f>& corners2D,  
    Size imageSize,  
    Mat& intrinsic,               // output intrinsic matrix  
    Mat& distortionCoeffs,       // output distortion coefficients  
    vector<Mat>& Rvecs,          // rotation of each image  
    vector<Mat>& Tvecs          // translation of each image  
)`

# Calibration Part 3.

## Calibrate image with parameters

- `initUndistortRectifyMap(  
    Mat& intrinsicMat,  
    Mat& distortionCoeffs,  
    Mat(),  
    Mat& intrinsicMat,  
    Size imageSize,  
    CV_32FC1,  
    Mat& outputMapX,  
    Mat& outputMapY  
)`
- `remap(  
    Mat& inputImage,  
    Mat& outputImage,  
    Mat& outputMapX,  
    Mat& outputMapY,  
    INTER_LINEAR  
)`

# Calibration Part4.

## Save the parameters

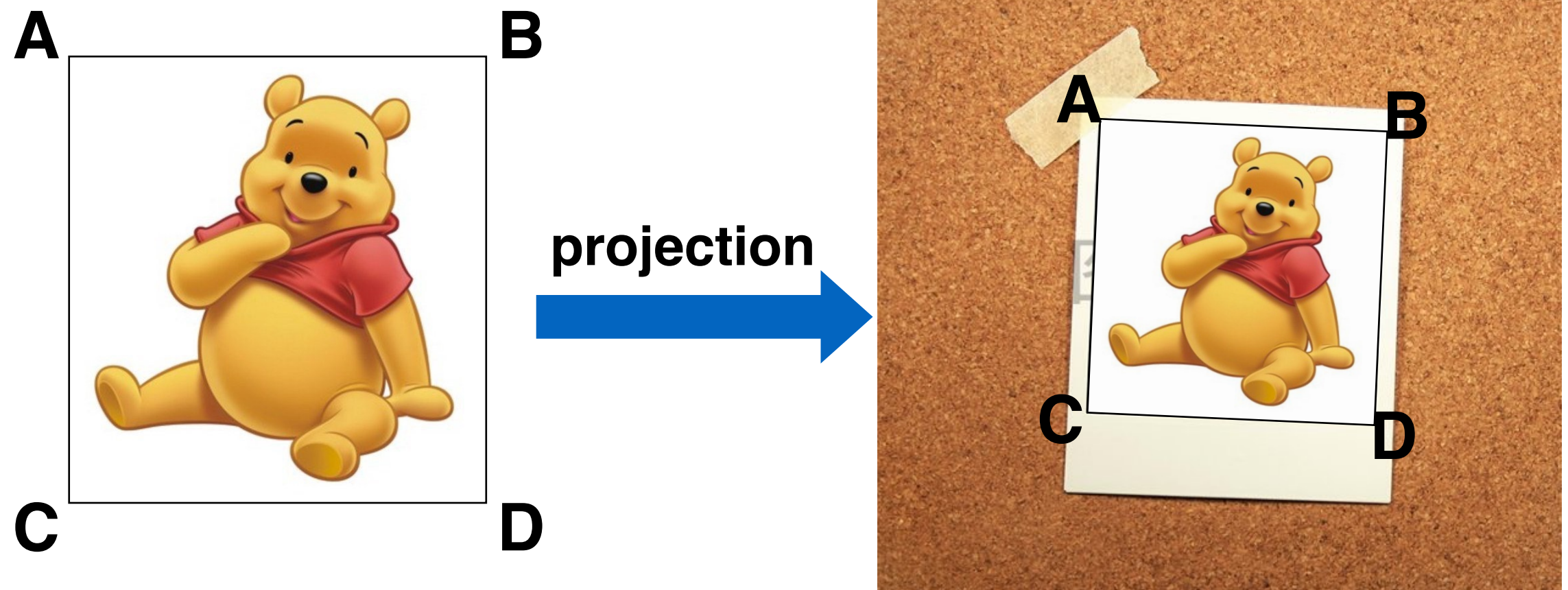
- Write:  
FileStorage fs("calibration.xml", FileStorage::WRITE);  
fs << "intrinsic" << intrinsic;  
fs << "distortion" << distortionCoeffs;
- Read:  
FileStorage fs("calibration.xml", FileStorage::READ);  
Mat intrinsic, distortionCoeffs;  
fs["intrinsic"] >> intrinsic;  
fs["distortion"] >> distortionCoeffs;

## 2. Warping (50%)





# 2. Warping (50%)

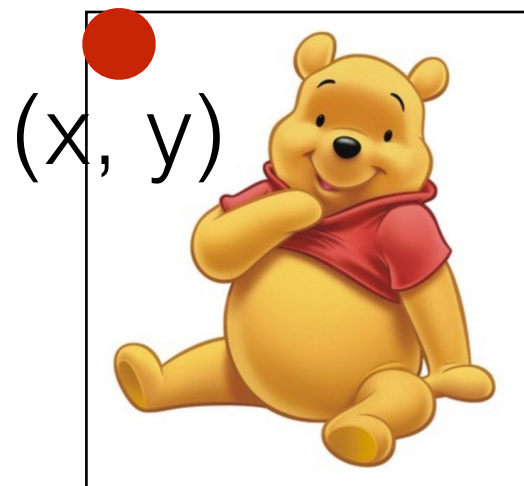


`getPerspectiveTransform(const Point2f src[], const Point2f dst[])`

1. src, dst: 4個點的陣列，擺放順序需要**兩兩相對**
2. 返回一個3X3的Mat

## 2. Warping (50%)

$$\begin{bmatrix} \text{Proj} \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix} = k^* \begin{bmatrix} i \\ j \\ 1 \end{bmatrix}$$



projection





# 2. Warping (50%)



+ webcam

**Input**



**Output**

# Upload

- Upload your calibration file(.xml) and your code onto E3  
team[Num]\_lab4.zip