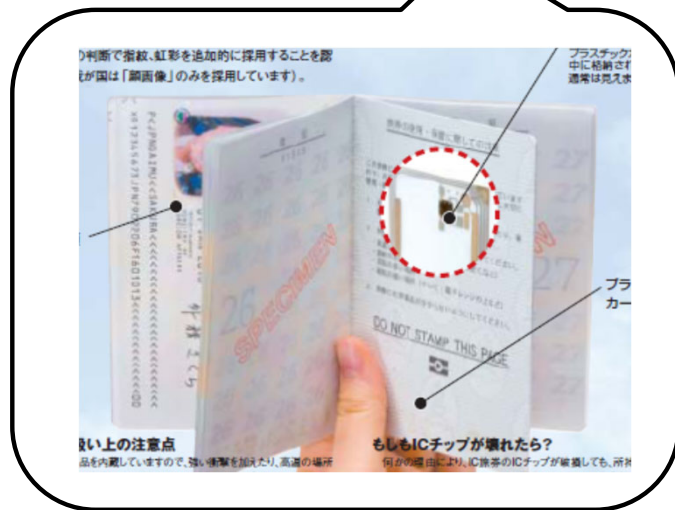# Inside of "facial recognition"
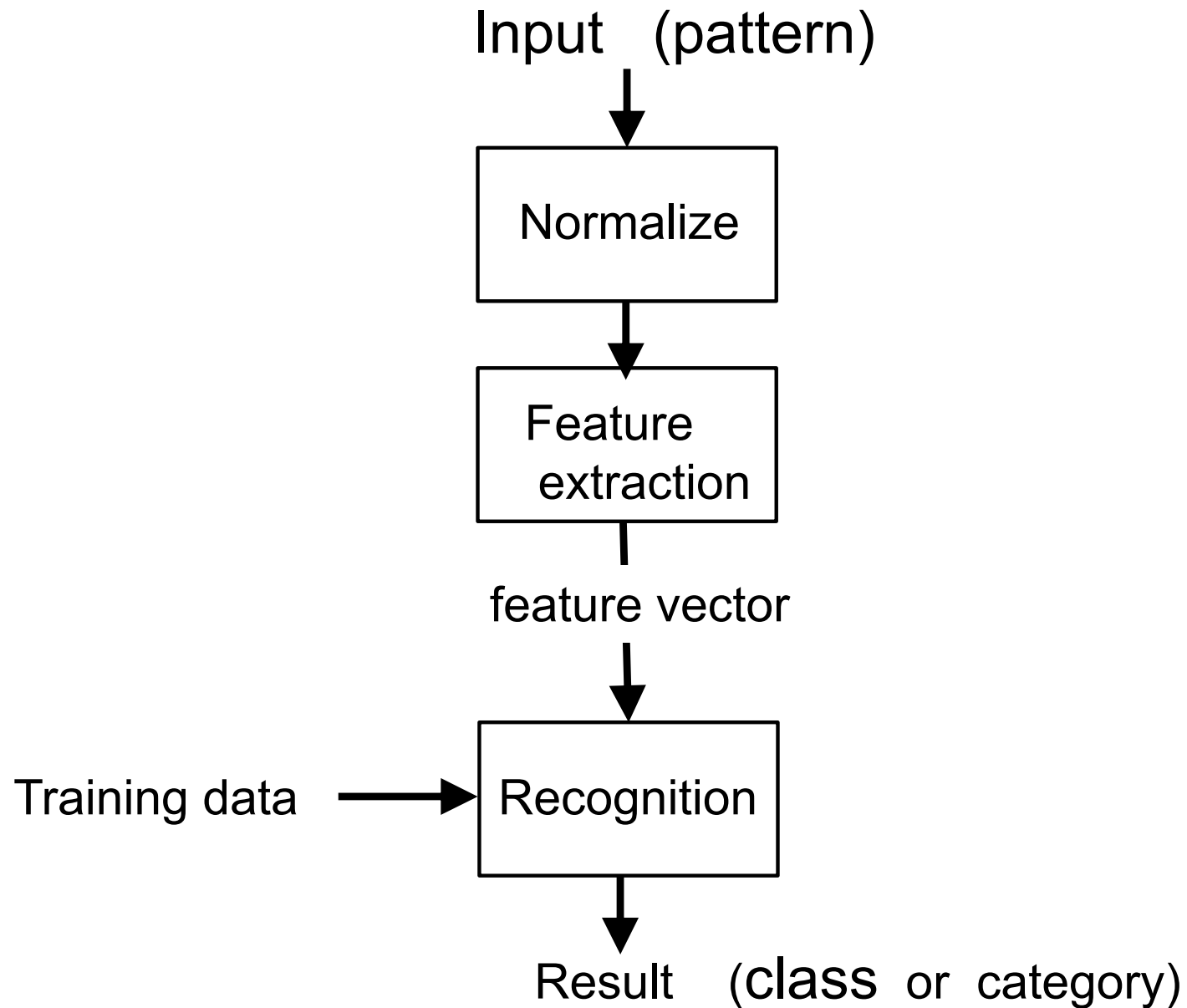
Additional explanation by Prof. Kiyasu

Application of face recognition for passport control in Japan

Immigration gate at airport
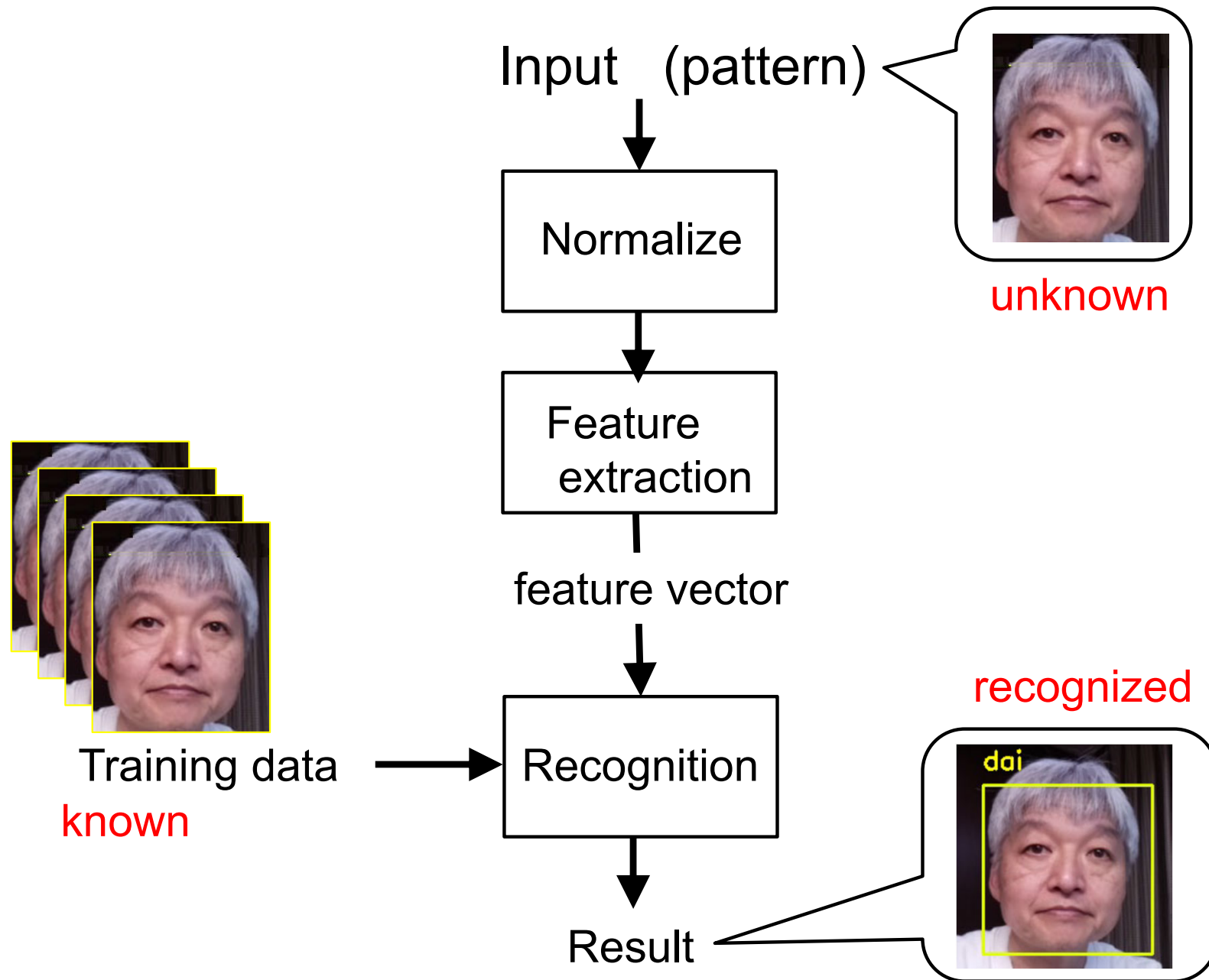
Normal procedure of pattern recognition
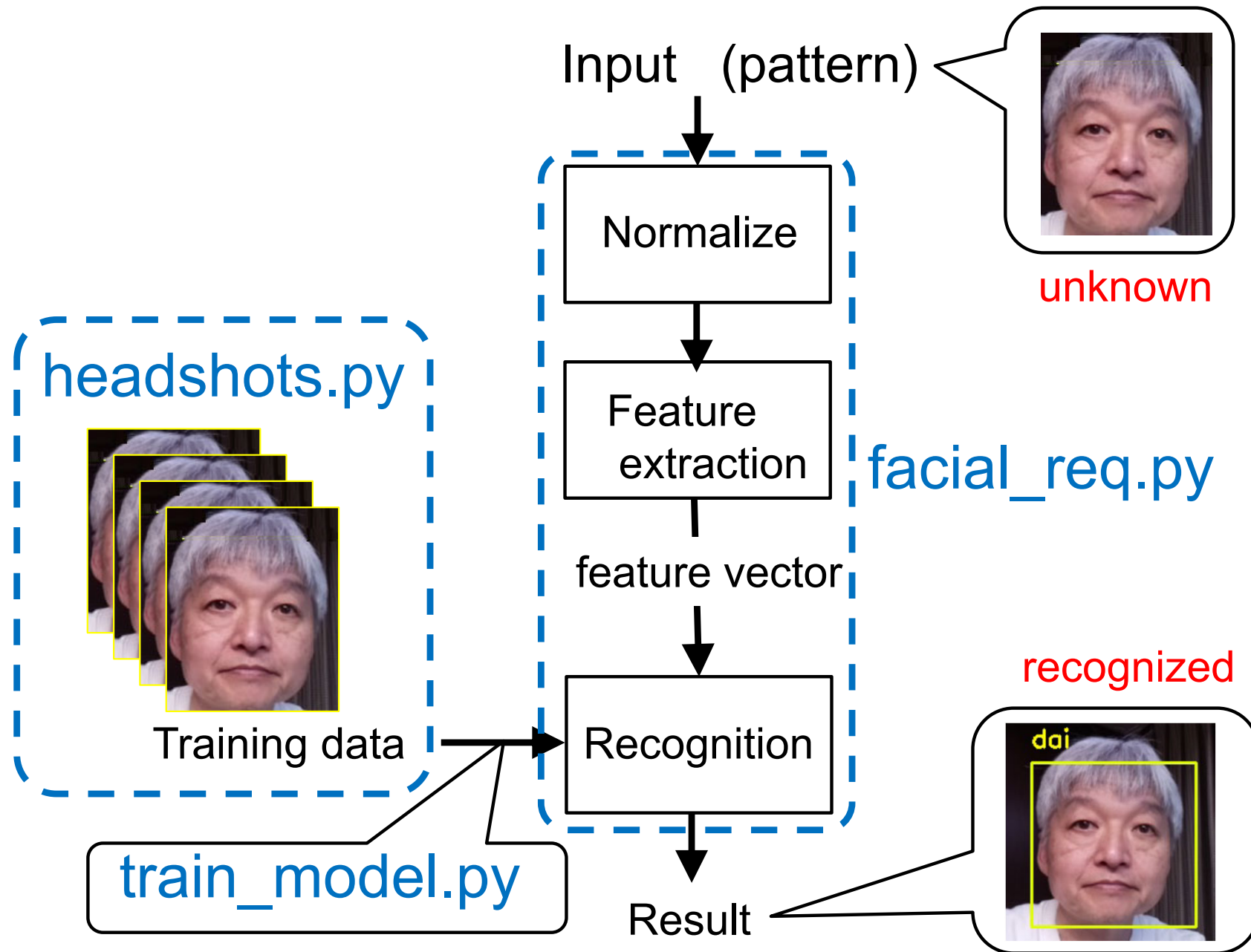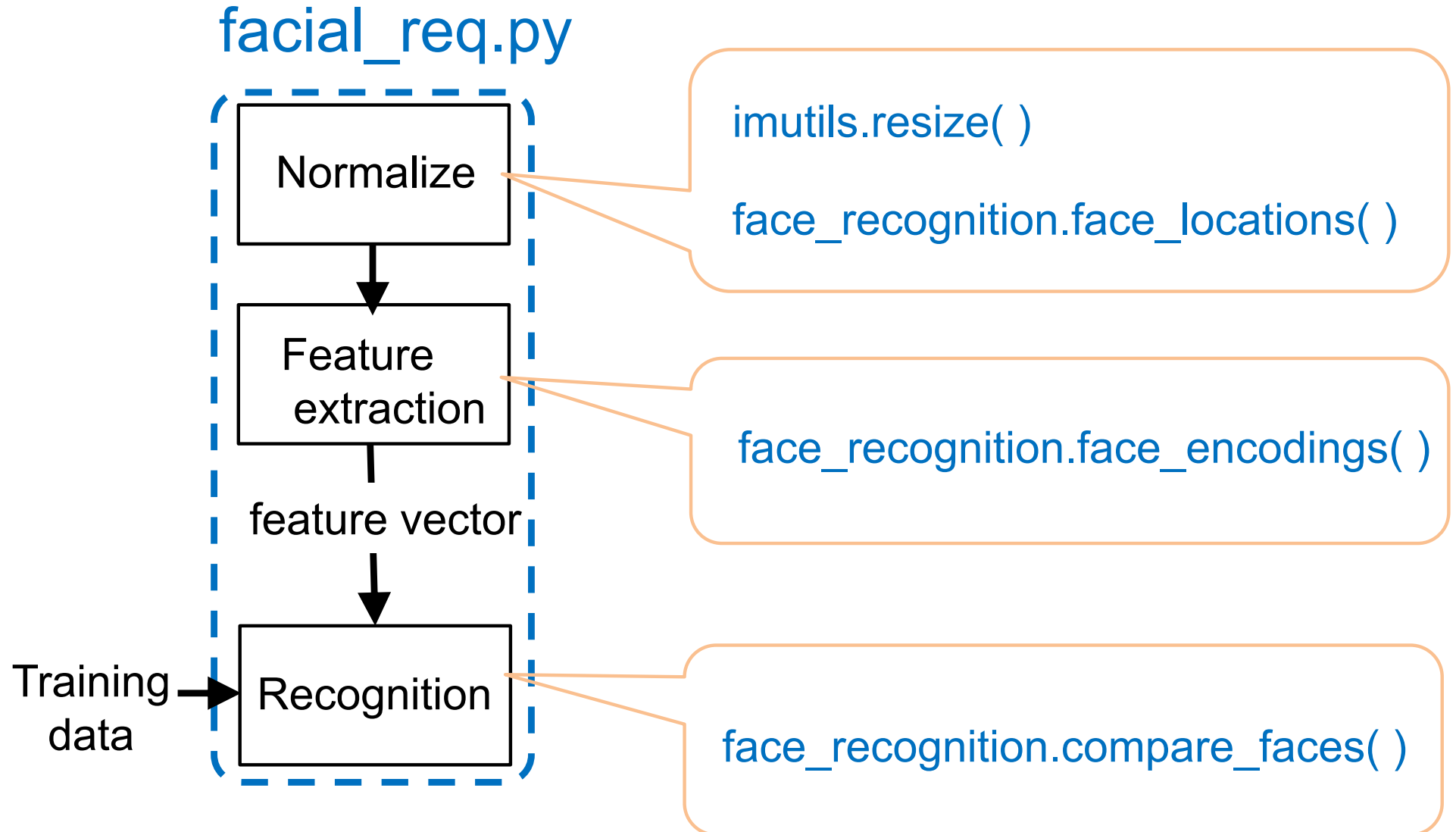
Input (pattern)

↓

Normalize

↓

Feature extraction

feature vector

↓

Training data → Recognition

↓

Result (class or category)

Normal procedure of pattern recognition

Procedure of facial_recognition

Inside of facial_req.py

facial_req.py

Normalize

imutils.resize( )

face_recognition.face_locations( )

Feature extraction

feature vector

face_recognition.face_encodings( )

Training data

Recognition

face_recognition.compare_faces( )

Normalize

Normalize

Feature extraction

feature vector

Recognition
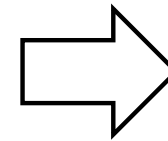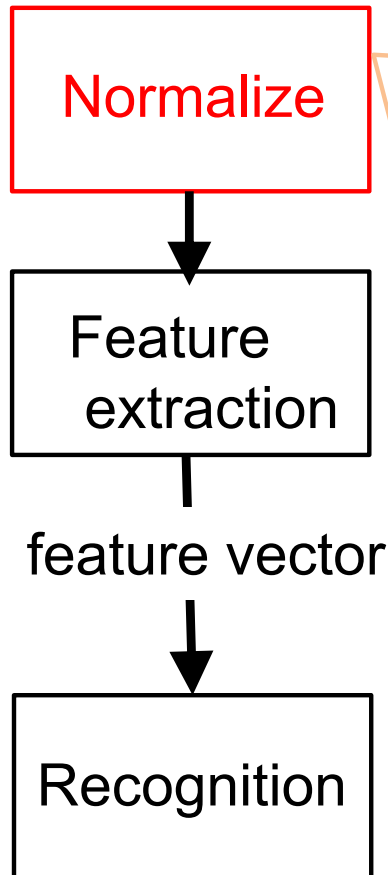
resize to 500 pixels

Find the location of faces
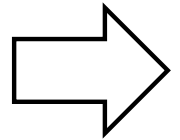(face detection)

How to find the location of faces

Face detection

 using the "dlib" library inside

`dlib.get_frontal_face_detector( )`

`This function uses HOG feature or CNN.`

Method by "Viola & Jones" is historically famous for face detection.

Rapid Object Detection using a Boosted Cascade of Simple Features

Paul Viola
viola@merl.com
Mitsubishi Electric Research Labs
201 Broadway, 8th FL
Cambridge, MA 02139

Michael Jones
mjones@crl.dec.com
Compaq CRL
One Cambridge Center
Cambridge, MA 02142

Abstract

This paper describes a machine learning approach for visual object detection which is capable of processing images extremely rapidly and achieving high detection rates. This work is distinguished by three key contributions. The first

tected at 15 frames per second on a conventional 700 MHz Intel Pentium III. In other face detection systems, auxiliary information, such as image differences in video sequences, or pixel color in color images, have been used to achieve high frame rates. Our system achieves high frame rates working only with the information present in a single grey
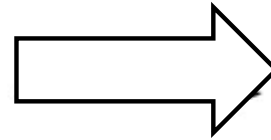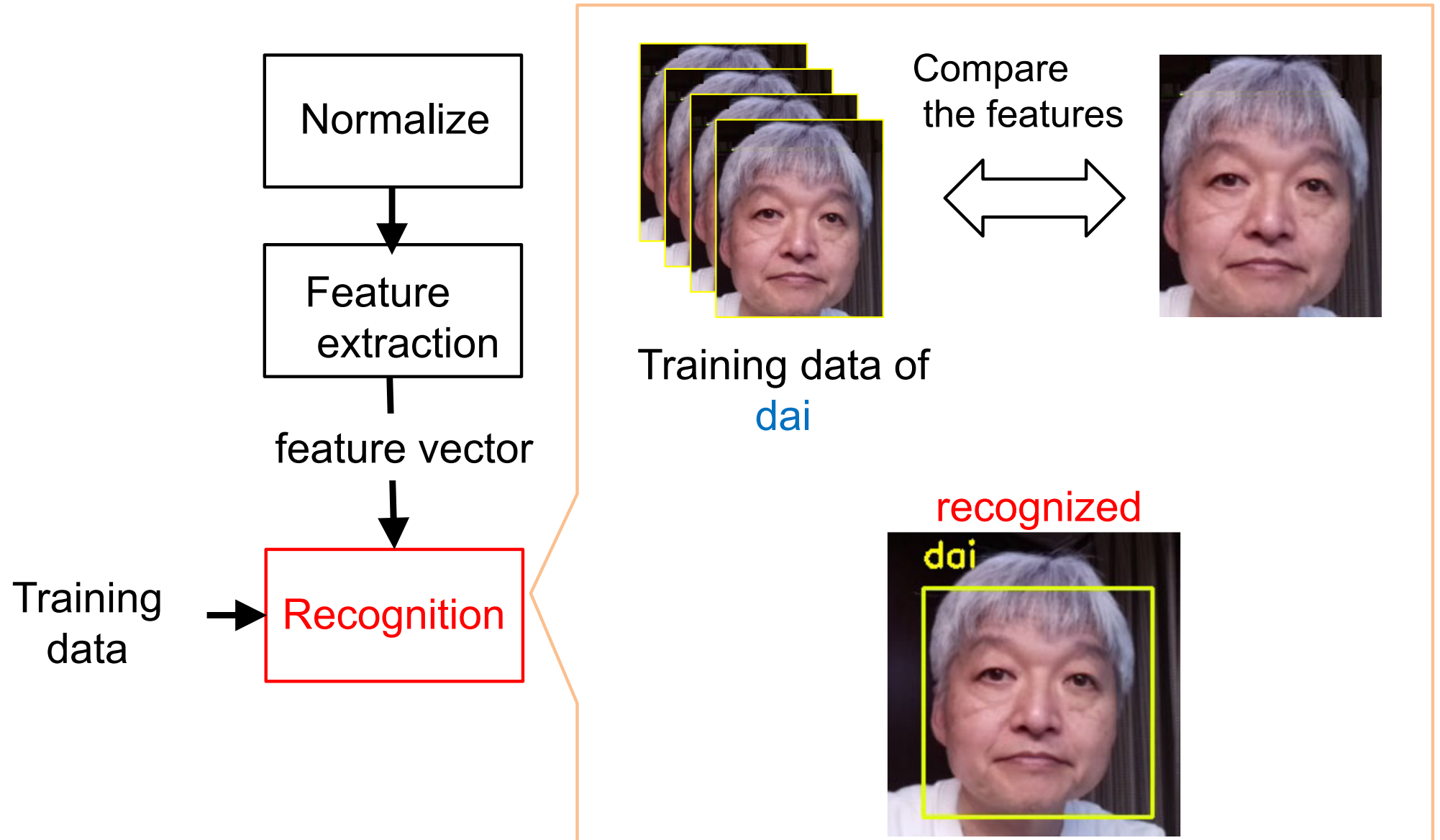
Sample results

Feature extraction

Normalize

Feature extraction

feature vector
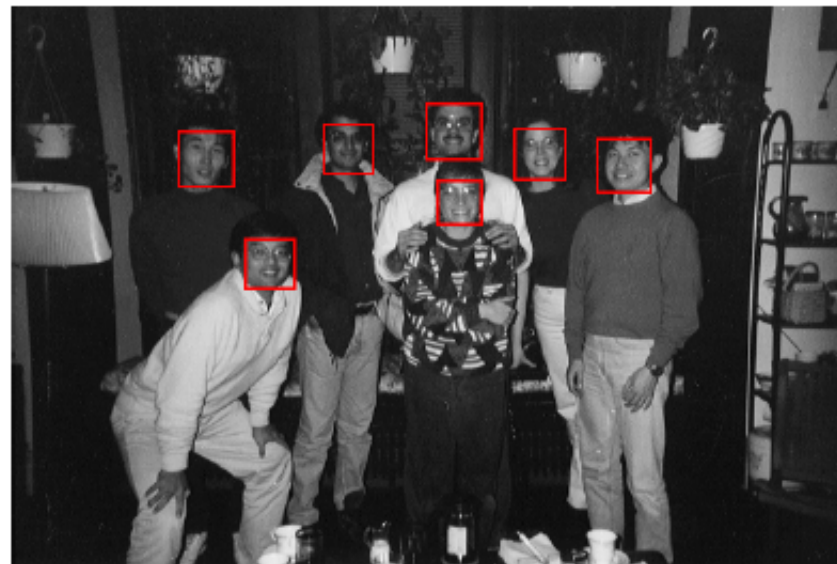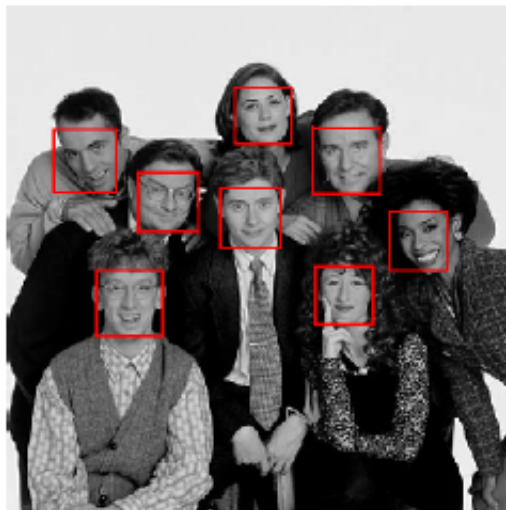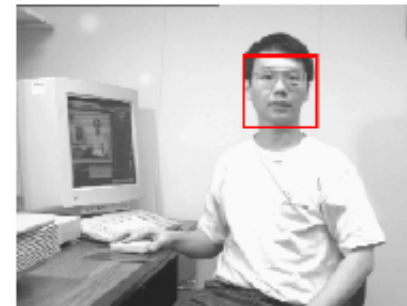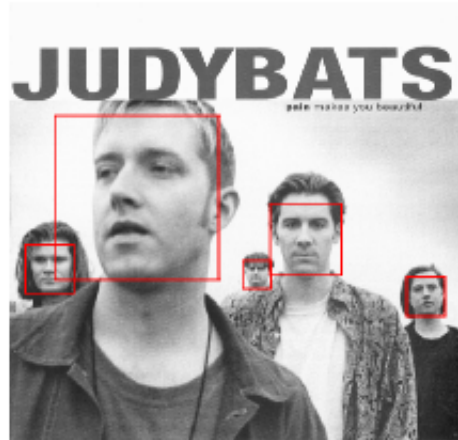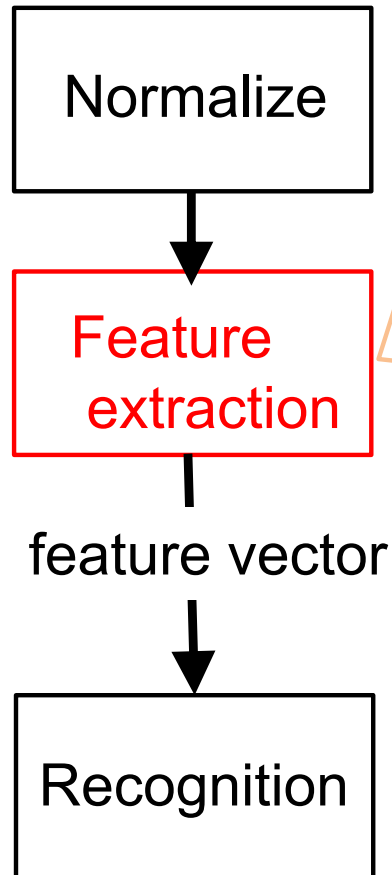
Recognition

Input

Output

Get the locations of eyes, nose, mouth, chin, etc.

and use for the features.

Recognition

Normalize

Feature extraction

feature vector

Training data → Recognition

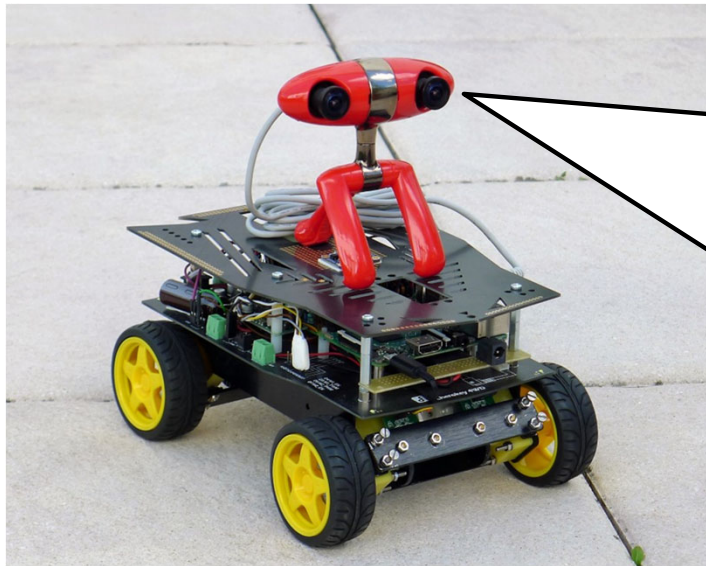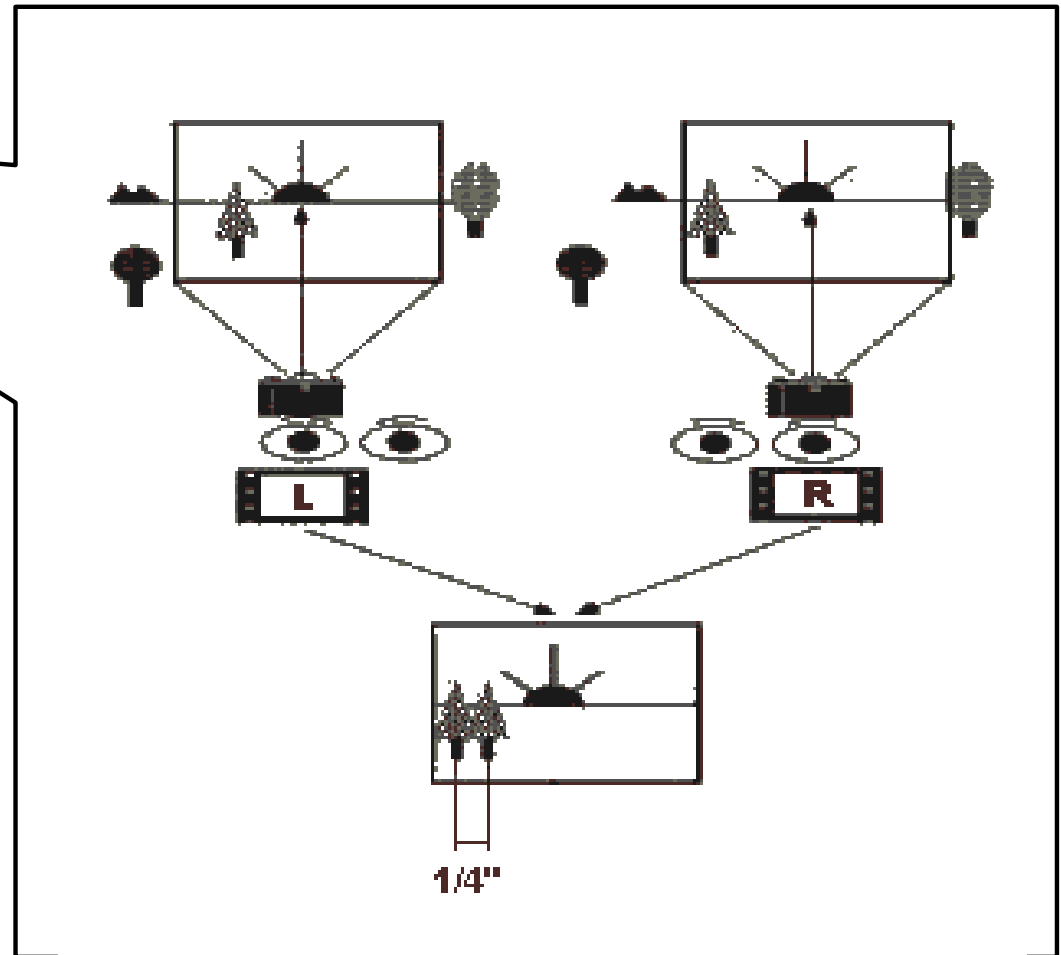Compare the features

Training data of
dai

recognized
dai

Small remarks for
using a camera on a mobile robot

Additional explanation by Prof. Kiyasu

Stereo camera on a mobile robot

Stereo camera

L   R

1/4"

https://boredomprojects.net/index.php/projects/
robot-navigation-using-stereo-vision
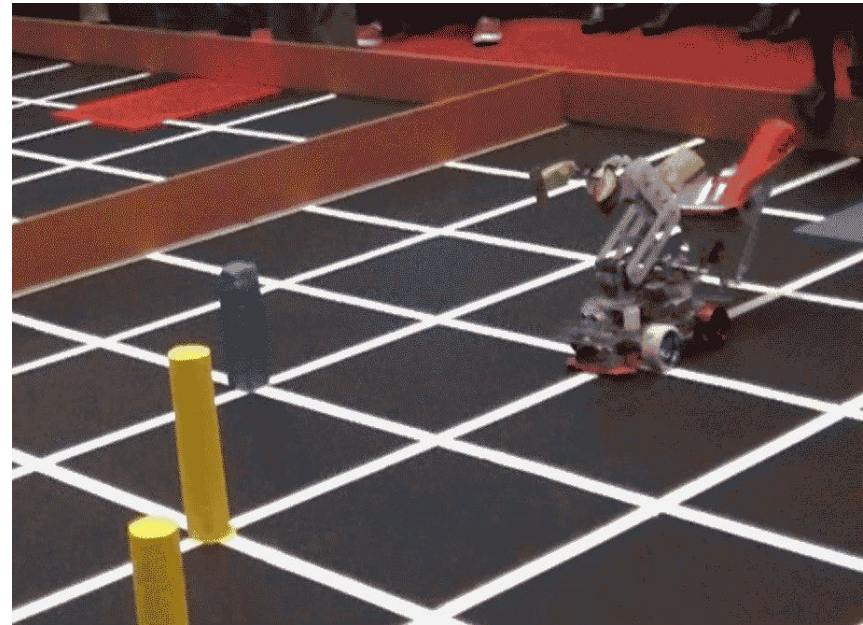
Possibility of single camera

Stereo camera is needed especially in unknown environment.

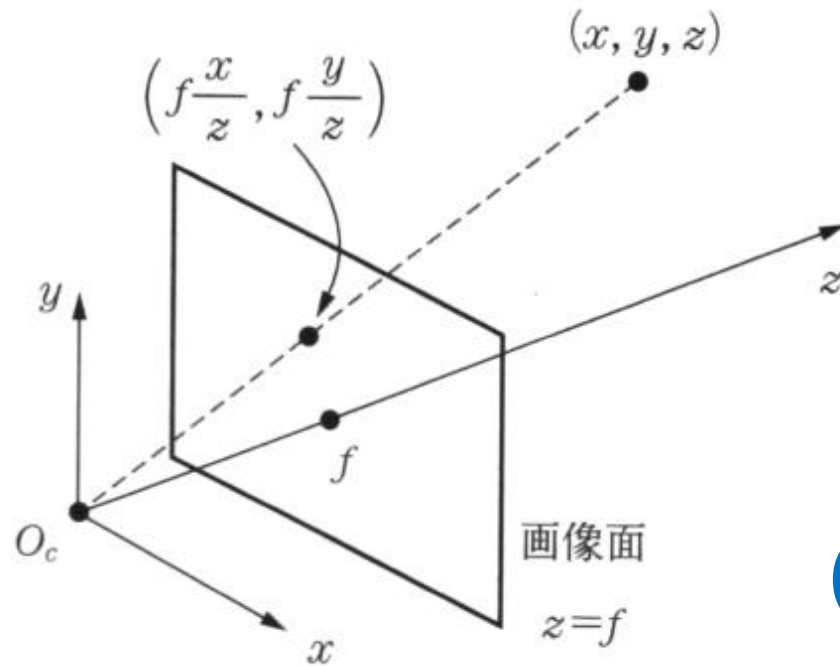In the robot contest, target objects are already known. → Single camera can estimate several information.

Mars Exploration Rover

https://en.wikipedia.org/wiki/Mars_Exploration_Rover

Position

When the shape of objects are known, position may be estimated based on the inverse transformation of perspective projection.
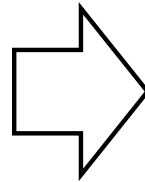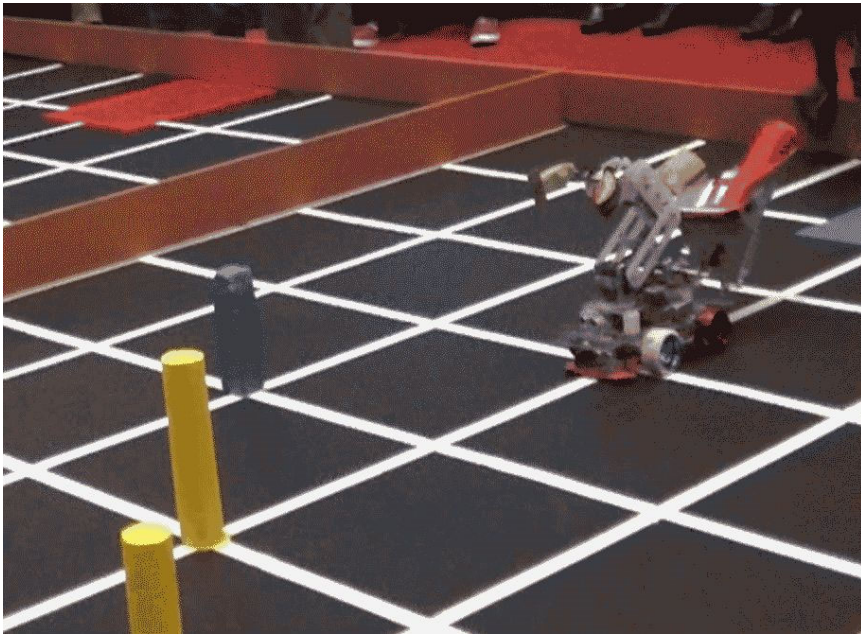

$$(x, y, z) \rightarrow (f\frac{x}{z}, f\frac{y}{z})$$

f : focal length

Color

Target objects may be recognized using color.

Thank you for your attention

kiyasu@nagasaki-u.ac.jp