Introducing OpenCV for Developers

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Authors

- Eiichiro Momma
  - Electrical Measurement Engineering
    - Image Processing & Analysis
  - Momma's wiki

http://www.eml.ele.cst.nihon-u.ac.jp/~momma/wiki/

- Takuya Minagawa
  - Freelance Engineer
    - Computer Vision, AR, ...
  - Presides at "Computer Vision Study Session in Kanto"
  - "OpenCVで学ぶ画像認識"(gihyo.jp)

Demonstration 1

Based on the technologies of OpenCV

OpenCV ?

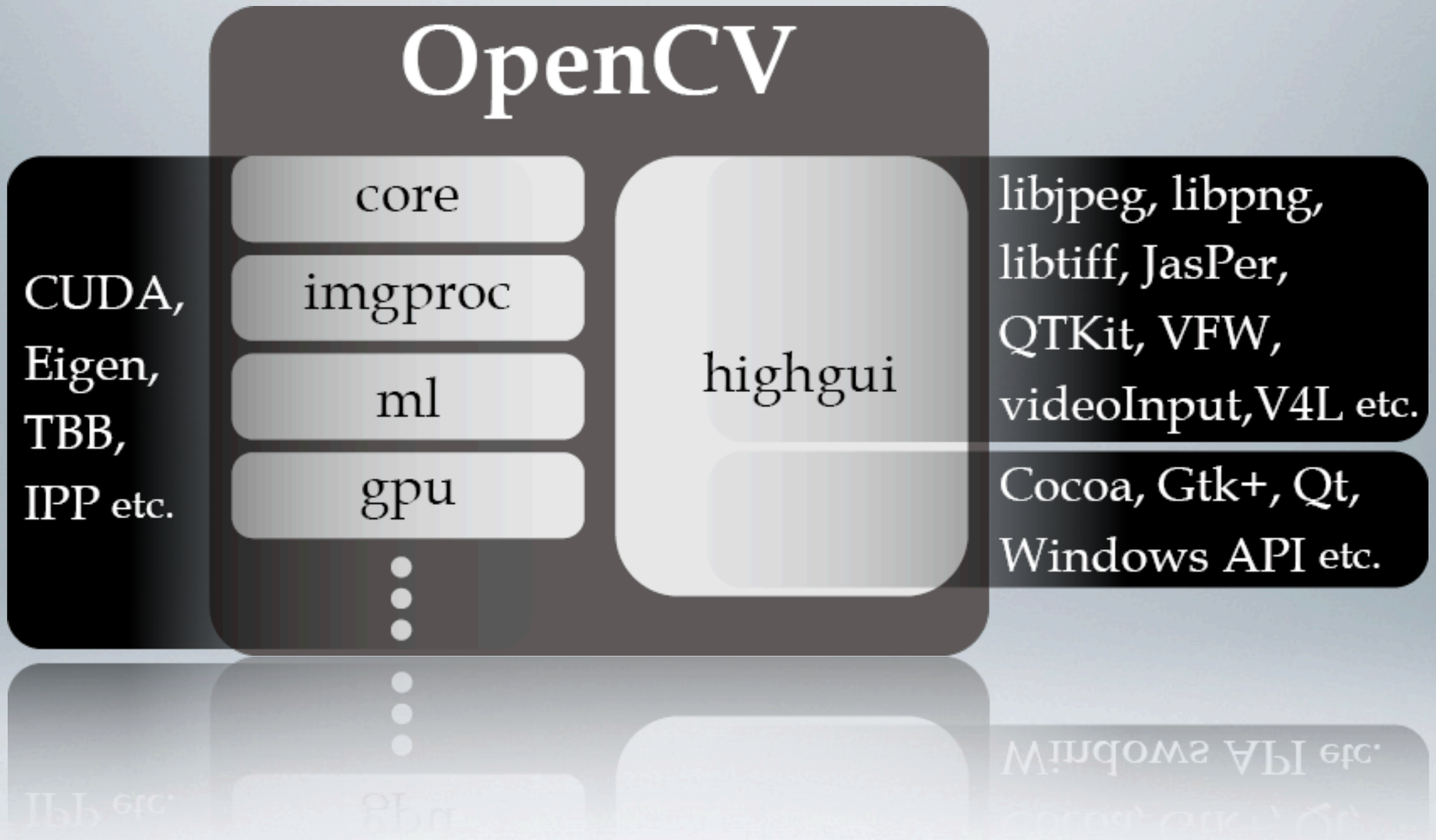
OpenCV?

- Open Source Computer Vision
- Freely available library for real-time computer vision
  - C, C++, Python, and Java interfaces
  - Mac OS X, Linux, Windows, and Android operating systems

```cpp
//HelloOpenCV.cpp
#include <opencv2/opencv.hpp>
int main(void)
{
    cv::Mat img = cv::imread("lena.jpg",CV_LOAD_IMAGE_COLOR);
    cv::imshow("src", img);
    cv::waitKey(0);
    return 0;
}
```

```cpp
//HelloOpenCV_c.c
#include <opencv/cv.h>
#include <opencv/highgui.h>
int main(void)
{
    IplImage *img = cvLoadImage("lena.jpg", CV_LOAD_IMAGE_COLOR);
    cvShowImage("src", img);
    cvWaitKey(0);
    return 0;
}
```

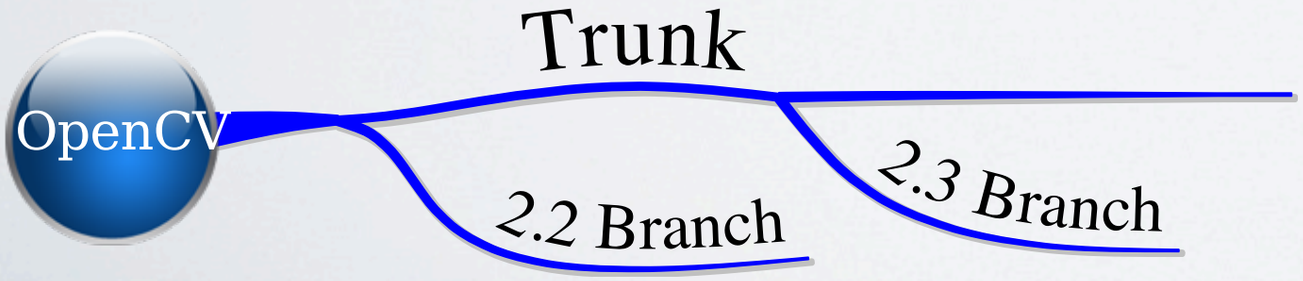
```python
#HelloOpenCV.py
import cv2 as cv
img = cv.imread('lena.jpg', cv.CV_LOAD_IMAGE_COLOR)
cv.imshow('src', img)
cv.waitKey(0)
```



Design Architecture

Distribution

- Binary installer
  - Available immediately
  - Delayed release
- Source tree
  - Managed in "Subversion"



- Structure of source tree
  - Trunk
    - Slightly unstable
    - Latest technologies
- Branches
  - Stable
  - Long-term use

Technologies Immediately Available (>500 Functions)

- "Image processing"
  - Converting color spaces, Thresholding, Edge detection, Morphological and geometric transformations, Histogram, Filtering, Structural analysis, Shape descriptors, Extracting Lines and Contours, Segmentation, etc.
- Video analysis
  - Optical flow, CamShift, meanShift, etc.
- Machine learning, object detection
  - FLANN, MLP, SVM, Cascade classification, etc.
- Feature detection and descriptor extraction
  - FAST, Good Features to Track, SIFT, SURF, ORB, etc.
- Camera calibration , 3D reconstruction,

Demonstration 2

"Image Processing"
Converting color spaces, Thresholding, Edge detection and Morphological transformations in multiple view

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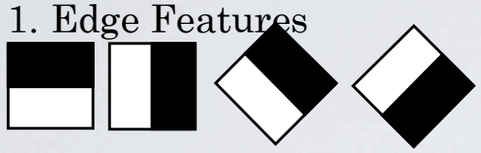
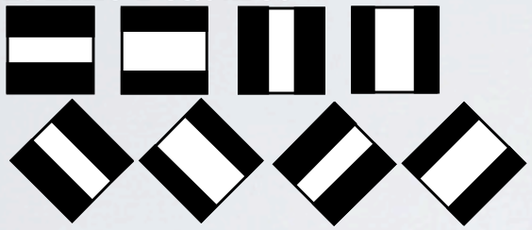
Face Detection

1. Edge Features



2. Line Features



3. Center-surround Features

Haar-like Features

AdaBoost

http://vimeo.com/12774628

JP.Viola and M.Jones, "Rapid Object Detection using a Boosted Cascade of Simple Features", IEEE CVPR, 2001.

E. Momma and T. Minagawa, RSJ2011

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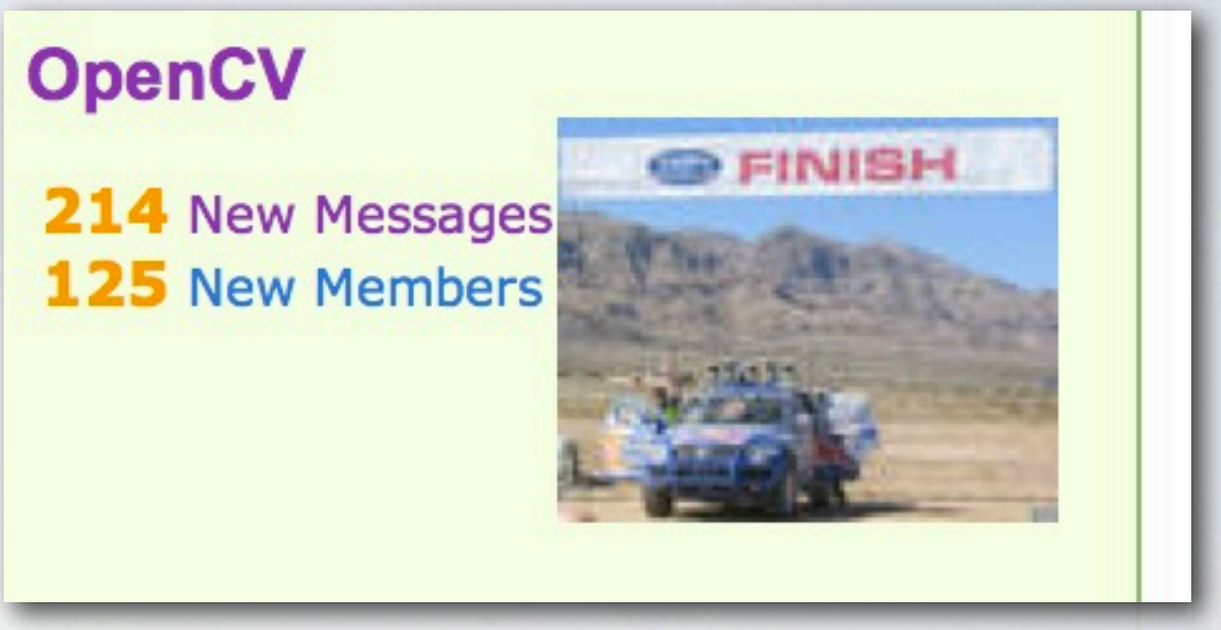
Demonstration 3

Display feature matching between a camera image and reference images

Communities

- In English
  - Mailing list in Yahoo! GROUPS
    - from newbies to developers
  - opencvlibrary-devel
    - for developers
- In Japanese
  - Some websites contain unified information
  - On twitter with hash #opencv
  - Study sessions involving the CVIM tutorial series
    - Nagoya, Kansai, Kanto



Conclusion and Future of OpenCV

- Conclusion
  - We described the various features of OpenCV and the communities.
- Future of OpenCV
  - 3D reconstruction
    - Point Cloud Library
    - KinectFusion
  - GPU computing
    - CUDA, OpenCL
  - Smartphones
    - Android (available from ver. 2.3.1), iPhone/iPad
- Slides, sources and images will be publicly released
  - http://goo.gl/RItcD

Related Links

- OpenCV: http://opencv.willowgarage.com/wiki/
- "Yahoo! GROUPS: OpenCV": http://tech.groups.yahoo.com/group/OpenCV/
- OpenCV.jp: http://opencv.jp/
- Nagoya CV and PRML Study Session: http://sites.google.com/site/nagoyacv/
- Kansai CV and PRML Study Session: http://groups.google.com/group/cvprml
- Computer Vision Study Session in Kanto: http://sites.google.com/site/cvsaisentan/