Detecting and Matching Interest Points

• **Big Idea**: instead of looking at the image as a whole, it could be advantageous to select some special points in the image and perform a local analysis on these ones.

• **Interest points, keypoints, feature points**
  – Object recognition, image registration, visual tracking, 3D reconstruction, and more...

• A few interest point detectors we'll see here
Detecting Harris corners

- Corners come out as interesting feature points
- Corners can be easily and accurately localized even at sub-pixel accuracy
- Abound in man-made objects
- Harris feature detector – classical approach...
  - cv::cornerHarris()
  - image → **Harris** → image of floats → **Threshold** → set of detected corners
  - Its root lies in the **eigen decomposition theory**
A church in Astana, color and grayscale images
Harris map and circled corners
A church from the book
Harris at his best to detect corners
cv::goodFeaturesToTrack(...) more uniformly distributed corners etc...
Abstract class `cv::FeatureDetector` with `detect()` method

Features from Accelerated Segment Test

```cpp
cv::FastFeatureDetector fast(40);
fast.detect(image, keypoints);
```
Abstract class `cv::FeatureDetector` with `detect()` method

Good Feature to Track Detector

```cpp
cv::GoodFeaturesToTrackDetector gftt(
    500, // maximum number of corners to be returned
    0.01, // quality level
    10); // minimum allowed distance between points

gftt.detect(image, keypoints);```
Detecting the scale-invariant SURF features

- SURF = Speeded Up Robust Features
- **Main idea** - to have a scale factor associated with each of the detected feature points
- Not only scale-invariant but also efficient (fast)
cv::SurfFeatureDetector()
cv::SiftFeatureDetector()

- More accurate feature detection
- Less efficient
MSER feature detector
Describing SURF features and matching (self-study)
some interesting stuff...

- Small interesting tutorials on basics of OpenCV may give you insight into what to do in your final project
    - Video capturing from camera or file
    - Coins counting
    - Detecting logos
    - Skin detection
    - Face detection
    - Skin detection for fast face tracking
Lab 8

- Complete the tutorials that support Chapter 8 of the textbook from
  http://docs.opencv.org/doc/tutorials/tutorials/tutorials.html
    - All tutorials from feature2d module. 2D Features framework
      total of 9 nice small and interesting tutorials...