Homework 2 Report

Final Result:

	DVD	CD	Book	Painting	Video	card
Color	1/3	4/12	7/24	17/60	49/83	2/9
Texture (or Edge)	4/6	0/2	2/2	51/99	27/39	4/12
Local Feature	154/276	177/325	106/212	68/144	300/364	78/176
Fusion (Optional)	179/273	215/325	121/211	88/167	316/357	98/192

Data Analysis

- Book covers, CD covers, DVD covers have serious rotation and affine transformation, therefore they do not do well on color-based and texture/shape-based matching.
- Business cards do not have much rotation, and the background are mostly clean. However, the images have relatively large margins.
- Museum paintings have clean background and do not have serious affine transformation and rotation. Therefore, they do well in color-based and texture/shape-based matching.
- Although video frames have some serious affine transformation, they take up most of the image and therefore do pretty well in color-based matching.

Experiments

1. Color Histogram

   Poor performance on most tasks except "Painting" and "Video".

   a. Global / Regional

   Regional color similarity is much better. Tried various regional sizes by slicing image into 4, 9, 25, 100 smaller regions. The smaller the region, the better the performance.

   b. Bins

   Tried bin counts 8, 16, 32, 64, 128, 256. Does not make much difference. Bins=16 performs best.

   c. RGB / HSV

   Transforming RGB to HSV colorspace has significant improvement.

   d. Cropping Image

   Significant improvement after cropping!

	DVD	CD	Book	Painting	Video	card
Global color (RGB)	0/2	1/4	4/9	3/24	4/14	3/4
Global color (HSV)	1/3	1/6	5/8	4/16	4/26	1/3
Local color (RGB)	0/4	4/7	6/18	33/66	28/54	4/6
Local color (HSV)	1/3	4/12	7/24	17/60	49/83	2/9
Local color (HSV) + crop image	3/7	6/21	18/39	17/60	49/83	12/22

2. Texture / Shape Similarity

   Poor Performance. Only HOG performs well on Painting

   a. Gabor

   b. HOG

	DVD	CD	Book	Painting	Video	card
Gabor	0/0	0/3	0/8	0/0	1/4	0/0
HOG	4/6	0/2	2/2	51/99	27/39	4/12

3. Local feature similarity

	DVD	CD	Book	Painting	Video	card
SIFT(high threshold)	146/226	230/296	108/159	78/131	282/323	80/148
SIFT(low threshold)	154/276	177/325	106/212	68/144	300/364	78/176
SIFT(low threshold) + HOG	179/273	215/325	121/211	88/167	316/357	98/192