HCI/ComS 575X: Computational Perception
Homework 3
Out: Wed Feb 18, 2009
Due: Wed Mar 4, 2009
Submission format: post code and videos on your section of the class wiki page.

Problem 1 – Highlight and count the red balloons
Solve this problem by modifying videos with OpenCV or image sequences with Matlab.

In this problem the task is to highlight and count all the red balloons in two videos.
Highlight balloons by placing a bounding box around them. Two videos for this task are
available on the course wiki.

Please make your output videos look similar to Fig. 1 and to the sample output videos
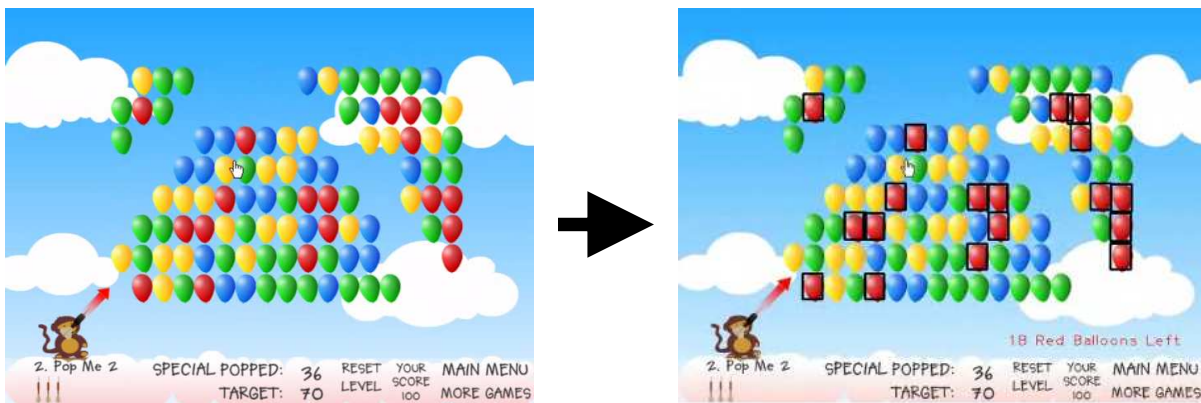shown on the wiki.

Figure 1: Highlight the red balloons with a bounding box
and display a counter (shown in red).

Problem 2 – Determine the amount of liquid left in a bottle
Solve this problem by modifying videos with OpenCV or image sequences with Matlab.

In this problem the task is to calculate the amount of liquid remaining in a bottle. A color video and a depth video of the same scene are available on the course wiki (see Fig. 2).
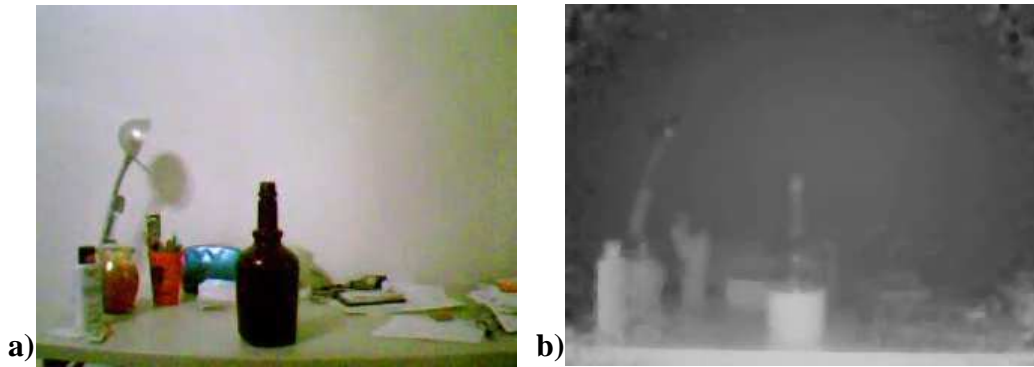

Figure 2: a) Color and b) depth images of a bottle.

Your program should create a new video that displays the percent of liquid left. For example, your display could be similar to that shown in Fig. 3.
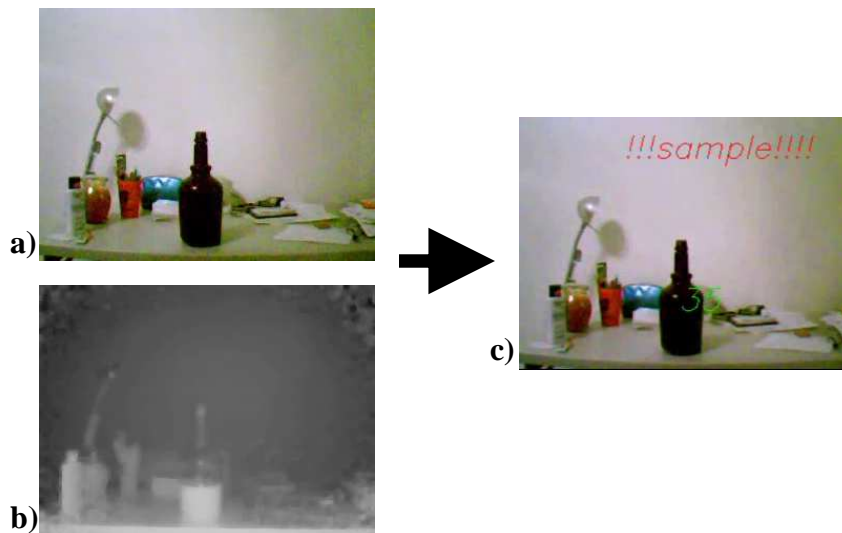

Figure 3: a-b) Color and depth images should be used to determine the amount of liquid remaining. c) The percent remaining is calculated and shown in a new video (35 is displayed in green, but it's hard to see).

NOTE. The depth video was recorded in a 3-channel format (as opposed to a 1-channel format). You will have to extract the depth channel using `cvCvtPixToPlane`. For example: `cvCvtPixToPlane(img[1], depth, 0, 0, 0);`, where `img[1]` is the image from the capture and `depth` is the 1-channel grayscale image.

Problem 3 – How many blocks in a bucket?
Solve this problem by modifying videos with OpenCV or image sequences with Matlab.

In this problem the task is to keep count of the number of blocks in each bucket. Two sets of color and depth videos are available on the course wiki (see Fig. 4).
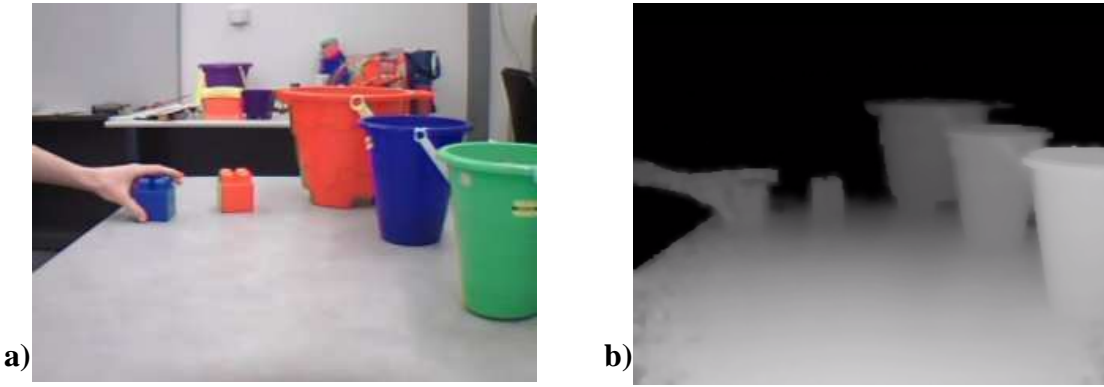

a)   b)

Figure 4: a-b) Screenshots of one set of color and depth videos for this task.

Your program should create a new color video that displays the count directly on the bucket (see Fig. 5). You can make a few assumptions:
1. There are three buckets, one red, one green, and one blue
2. The buckets are on the right side
3. The hand approaches each bucket from the left side
4. Blocks are only dropped inside when the hand is above the bucket.

Figure 5: A screenshot of a modified video that displays the number of blocks in each bucket.

NOTE. The depth videos were recorded in a 3-channel format (as opposed to a 1-channel format). You will have to extract depth channel using `cvCvtPixToPlane`. For example: `cvCvtPixToPlane(img[1], depth, 0, 0, 0);`, where `img[1]` is the image from the capture and `depth` is the 1-channel grayscale image.