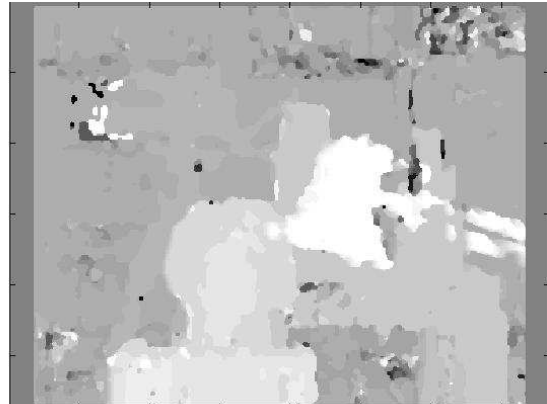
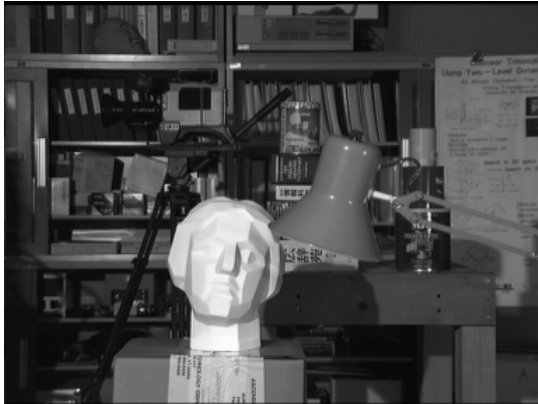


CSE 398/498-010

Real-time Image Processing for Autonomous Robot Systems

Homework: Correlation Based Stereo

Report Due Date: Thursday, 28 Oct 04 at the beginning of class



**A. Objective:**

1. Using correlation based techniques, recover a disparity map for the stereo image pair
2. Investigate techniques for identifying invalid correlation matches
3. Investigate improving the disparity map through spatial continuity techniques

**B. Requirements:**

1. You may use either C/C++ or Matlab to complete this assignment.
2. You may NOT employ any built-in image *processing* functions (e.g., filtering, correlation, block matching, etc.).
3. This is an individual assignment. Each student is required to submit his/her own work in order to receive credit.

**C. Instructions:**

1. Download the stereo image pair from the course home page. These are a well used data set from Prof. Ohta's lab at the University of Tsukuba in Japan.
2. Write a function(s) to generate a disparity map from the two images using the sum of squared distance (SSD) metric for the quality function.
  - a. Assume a correlation window size of  $7 \times 7$
  - b. Assume an appropriate disparity range from inspecting the images.
  - c. You may assume that the images are properly rectified (so you only need search in the x direction).
3. Generate both left-to-right and right-to-left disparity maps.
4. Generate a binary image of valid (white) and invalid correspondences (black). To do this, you will investigate that the left-to-right and right-to-left disparities are consistent for each pixel.

5. Investigate image processing techniques (median filtering, etc.) for improving the spatial continuity of the image.

**D. Some Potentially Helpful Matlab Functions/Commands:**

1. `imread`
2. `single` (you will probably need this to transform the images from `uchar` to float data types)
3. `find`
4. `min`
5. `sum`
6. `imagesc`
7. `colormap gray`

**E. Turn in:**

1. A write-up, to include images of disparity maps from SSD, valid/invalid pixels, enhanced disparity maps, etc.
2. Your Matlab/C/C++ source code.