CS 532: Homework Assignment 2

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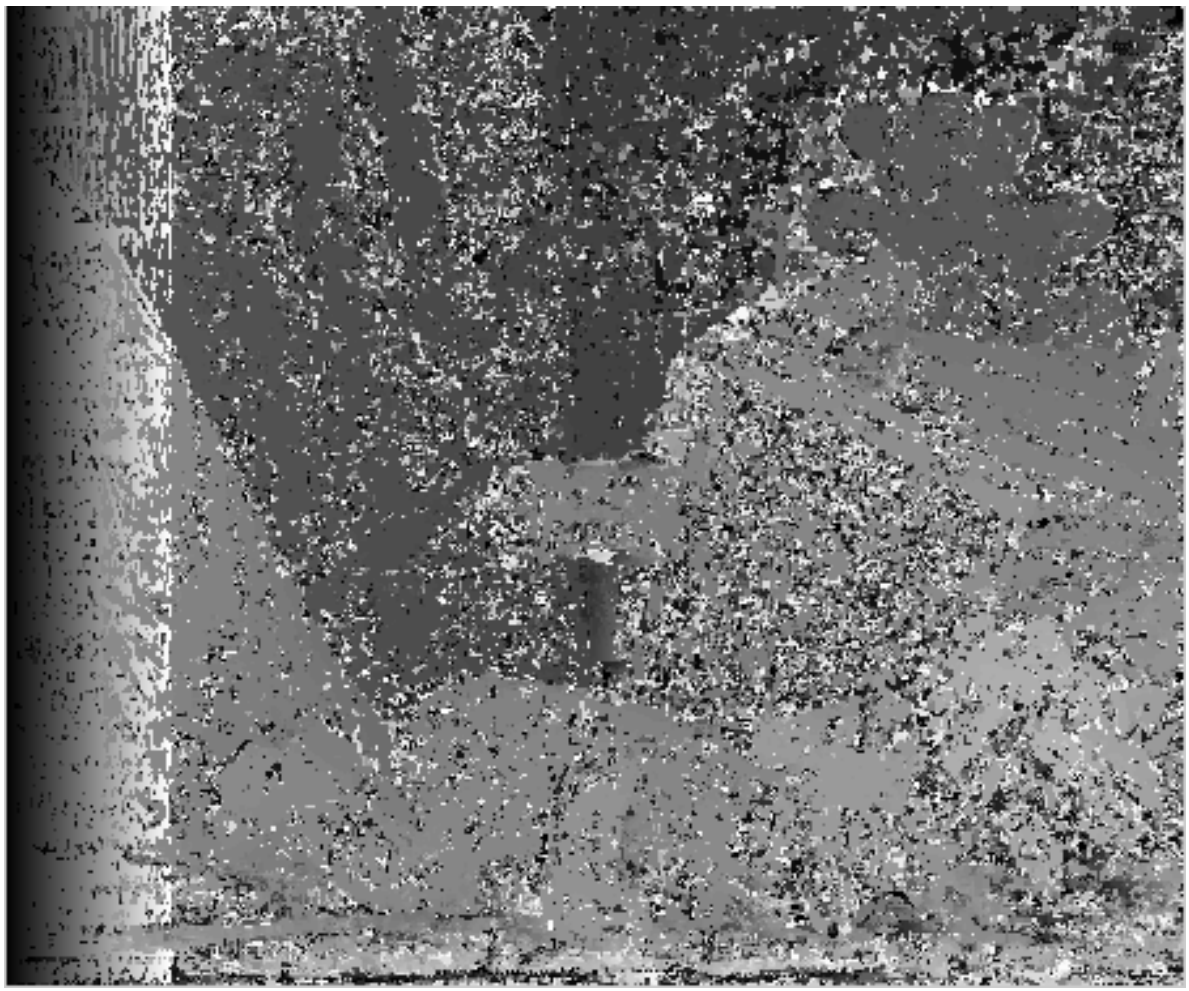
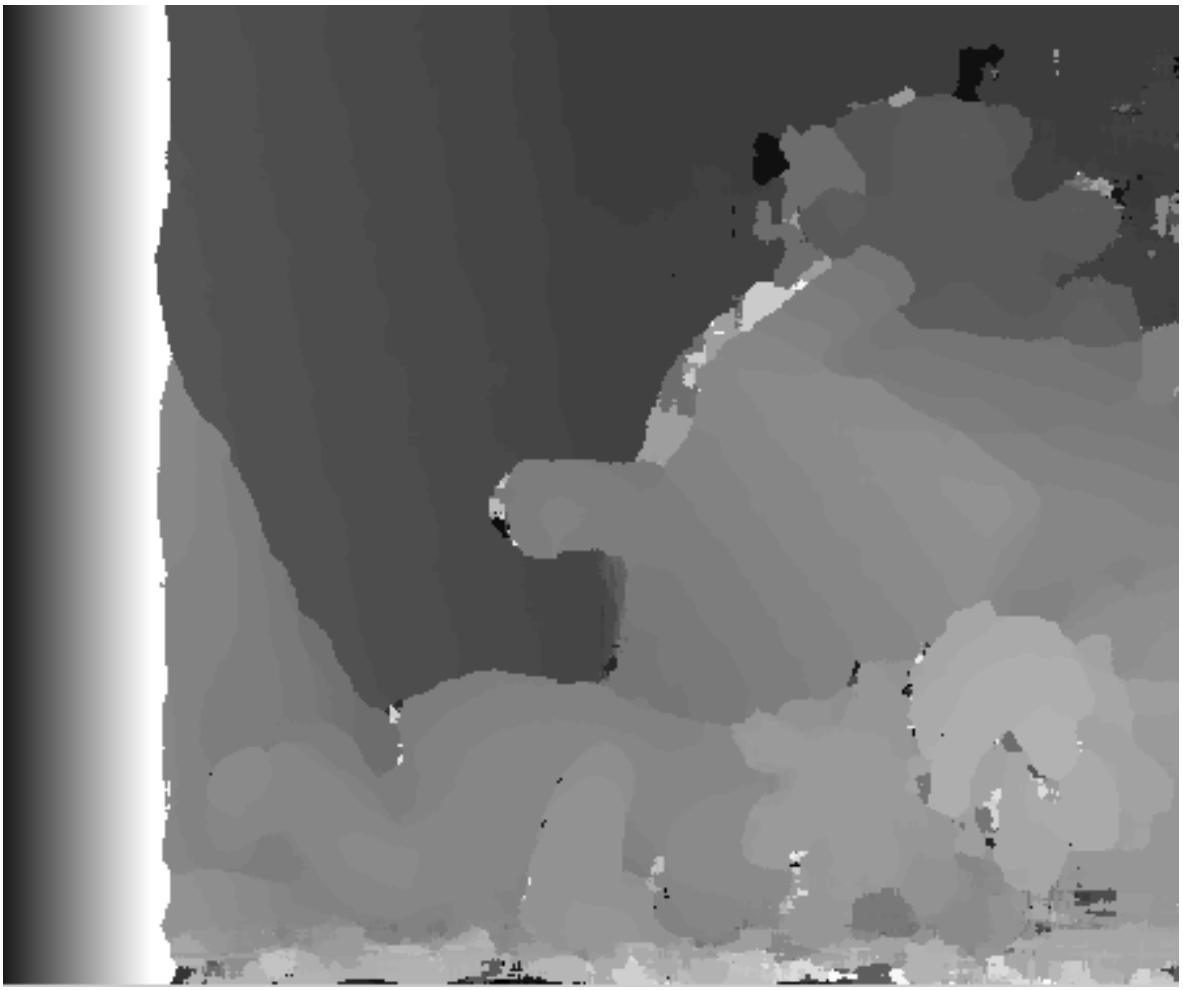
Problem 1



3x3 SAD window. Error rate = 49.71%



15x15 SAD window. Error rate = 27.60%

Problem 2

When computing the PKRN values, some of the pixels gave NaN and Inf results. These were ignored in the evaluation. So, out of 168750 pixels in the original disparity map, only 168670 had good PKRN values. Thus, the sparse disparity map computed using the 50% most confident pixels has 84335 pixels. And the error rate was 36.59%.

CODE (MatLab)

```
%% Inicialization

min_disp = 0;
max_disp = 63;
rank = 5;
window = 3;
% window = 15;
```

```
lft = imread('teddyL.pgm');
rgt = imread('teddyR.pgm');

height = size(lft, 1);
width  = size(lft, 2);

%% Rank transform

rnklft = zeros(size(lft));
rnkrgt = zeros(size(rgt));
half_rnk = (rank-1)/2;

for i = 1:height
    for j = 1:width  % all pixels
        lims = [max(1,i-half_rnk); min(height, i+half_rnk);
               max(1,j-half_rnk); min(width, j+half_rnk)];
        lftwin = double(lft(lims(1):lims(2),
lims(3):lims(4)));
        rnklft(i,j) = sum(sum(lftwin < lft(i,j)));

        rgtwin = double(rgt(lims(1):lims(2),
lims(3):lims(4)));
        rnkrgt(i,j) = sum(sum(rgtwin < rgt(i,j)));
    end
end

disp('Rank transformed');

%% SAD stereo matching

half_win = (window-1)/2;
disparity = inf(size(lft));
pkrn = inf(size(lft,1)*size(lft,2), 3);
count = 1;

for i = 1:height
    for j = 1:width  % all pixels
       curr_min_disp = inf(1,max_disp-min_disp+1);
       for d = min_disp:max_disp  % all disparities
           if (j+half_win-d) > 0
```

```
                lims = [max(1,i-half_win); min(height, i
+half_win);
                        max(1,j-half_win); min(width, j
+half_win);
                        max(1,j-half_win-d); min(width, j
+half_win-d)];
                 offs = min(lims(6) - lims(5), lims(4) -
lims(3));
                 sumwin = sum(sum( ...
                    abs(double(rnklft(lims(1):lims(2),
lims(3):lims(3)+offs)) - ...
                        double(rnkrgt(lims(1):lims(2),
lims(5):lims(5)+offs)) ...
                          )));
                 curr_min_disp(d+1) = sumwin;
            else
                break; % exit the for loop
            end
        end
        [c1, idx] = min(curr_min_disp);
        curr_min_disp(idx) = [];
        [c2, ~] = min(curr_min_disp);
        disparity(i,j) = idx-1;
        pkrn(count, :) = [c2/c1 i j];

        count = count+1;

    end
end

%% Computing errors

disparity = double(disparity);
gt = imread('disp2.pgm');
gt = double(gt)./4;
erro = sum(sum(abs(gt - disparity) > 1)) / ...
       (size(lft,1)*size(lft,2))

figure, imshow(disparity, [min_disp max_disp]);

%% PKRN error
```

```
pkrn = sortrows(pkrn);
pkrn(isinf(pkrn(:,1)), :) = [];
pkrn(isnan(pkrn(:,1)), :) = [];
pkrn = pkrn(length(pkrn)/2:end, :);

idx = false(size(lft));

for k = 1:length(pkrn)
   idx(pkrn(k,2), pkrn(k,3)) = true;
end

erro2 = sum(sum(abs(gt(idx) - disparity(idx)) > 1)) /
sum(sum(idx))
```