CVIP PA2

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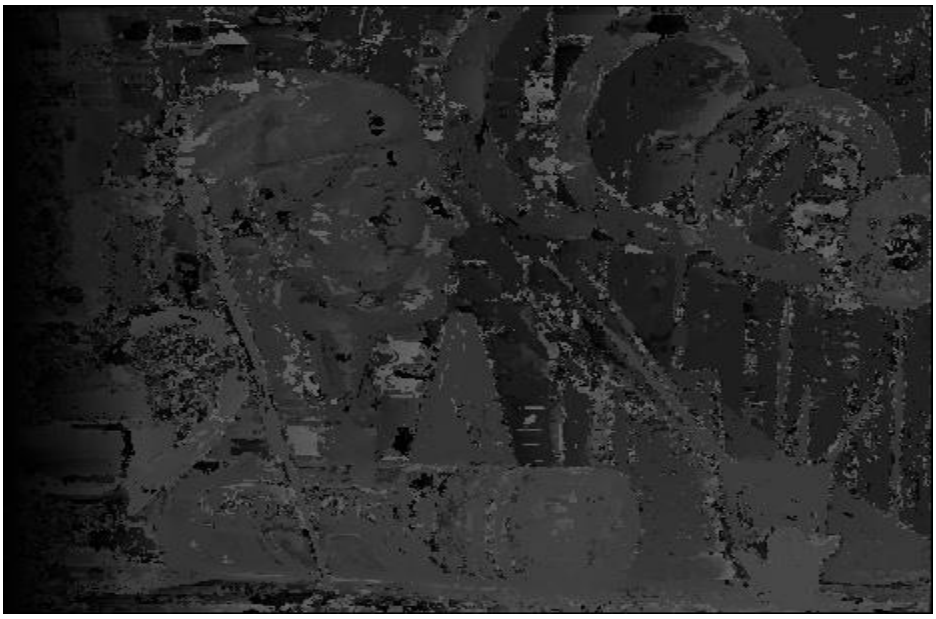
1. Stereo Vision

1.1 Disparity estimation using block matching

Generating Disparity Maps using 3x3 Block Size:

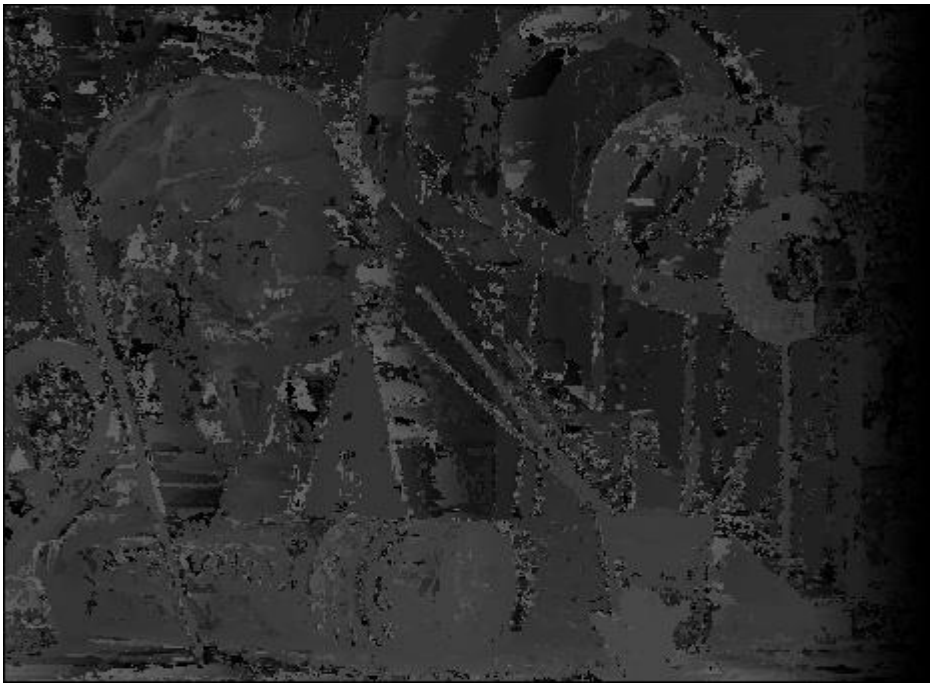
Left disparity Map:



Mean Squared Error:

```
MSE Left: 511.4610413869593
```

Right Disparity Map:

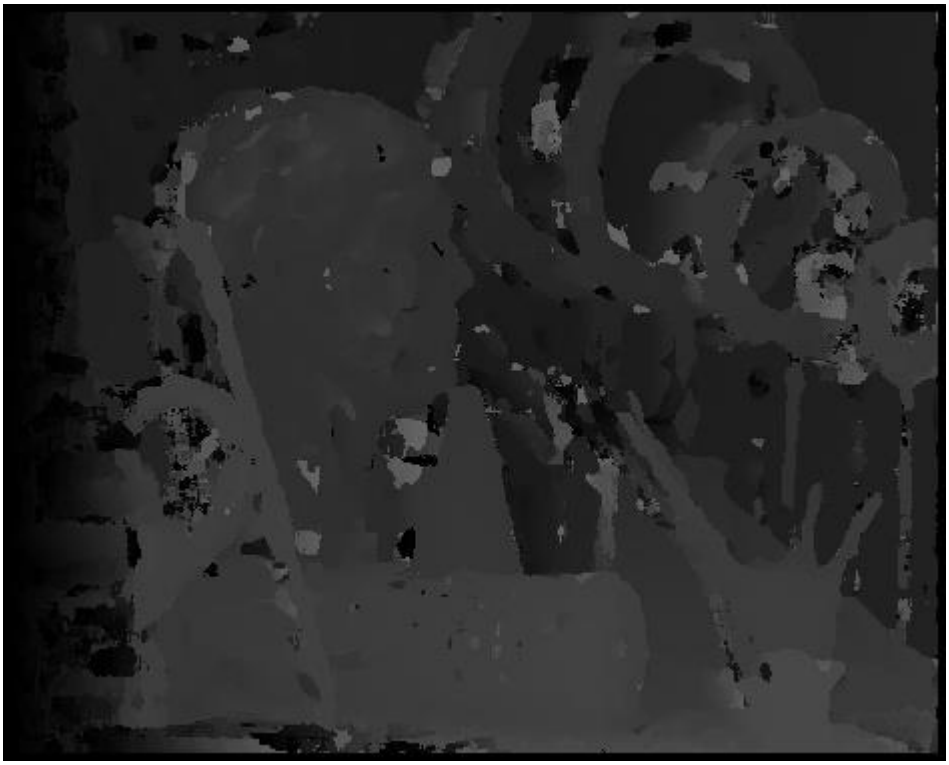


Mean Squared Error:

```
MSE Right: 407.7884887046874
```

Generating Disparity Maps using 9x9 Block Size:

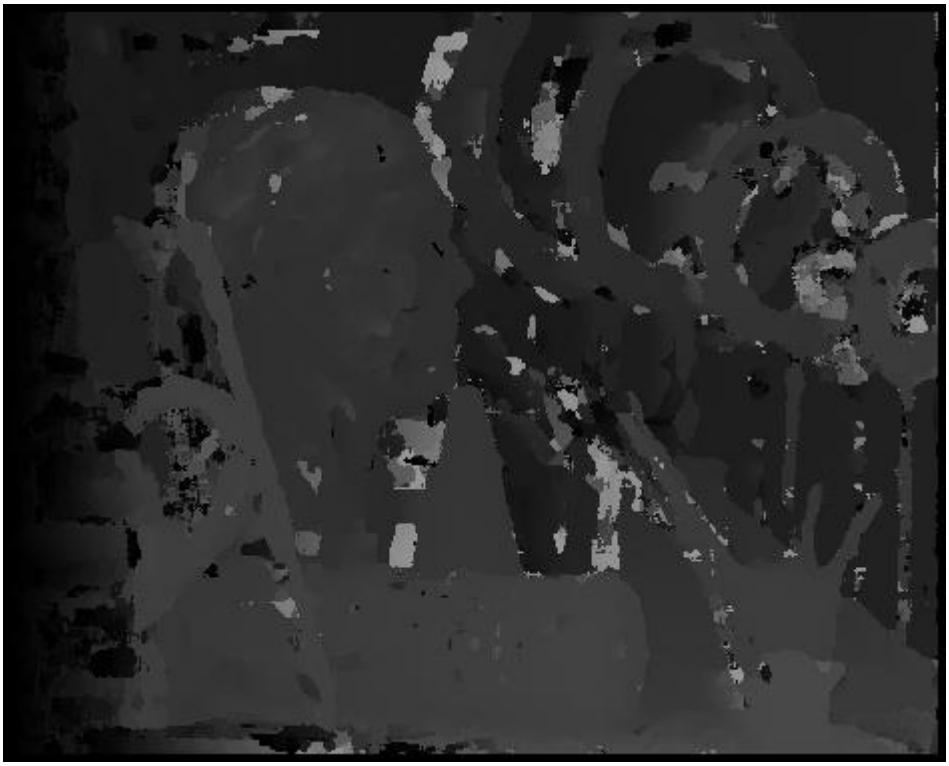
Left disparity Map:



Mean Squared Error:

```
MSE Left 9x9: 564.241521472944
```

Right disparity Map:



Mean Squared Error:

```
MSE Right 9x9: 230.02163583055304
```

1.2 Consistency check - Bonus

Consistency Left Map : 3x3 Block

Mean Squared Error: `MSE consistency left: 1302.631755297414`

In [ ]:

Consistency Right Map: 3x3 Block

Mean Squared Error : MSE consistency Right: 1173.9941451170394

Consistency Left Map: 9x9 Block

Mean Squared Error:

MSE consistency left 9x9: 950.4205956031858

Consistency Right Map: 9x9 Block

Mean Squared Error:

```
MSE consistency Right 9x9: 828.9149675911884
```

In [ ]:

1.3 Disparity estimation using Dynamic Programming

Pseudo Code:

```
Occlusion = [ln( (P_D/(1-P_D)) * (φ/(|(2π)^d S_s^{-1}|^{1/2})) )]
for (i=1;i≤ N;i++){ C(i,0) = i*Occlusion }
for (i=1;i≤ M;i++) { C(0,i) = i*Occlusion}
for(i=1;i≤ N;i++){
   for(j=1;j≤ M;j++){
      min1 = C(i-1,j-1)+c(z_{1,i},z_{2,j});
      min2 = C(i-1,j)+Occlusion;
      min3 = C(i,j-1)+Occlusion;
      C(i,j) = cmin = min(min1,min2,min3);
      if(min1==cmin) M(i,j) = 1;
      if(min2==cmin) M(i,j) = 2;
      if(min3==cmin) M(i,j) = 3;
   }}
```

Figure 2: Pseudo-code describing how to calculate the optimum match.

```
p=N;
q=M;
while(p!=0 && q!=0){
   switch(M(p,q)){
      case 1:
         p matches q
         p--;q--;
         break;
      case 2:
         p is unmatched
         p--;
         break;
      case 3:
         q is unmatched
         q--;
         break;
   }}
```

Figure 3: Pseudo-code describing how to reconstruct the optimum match.

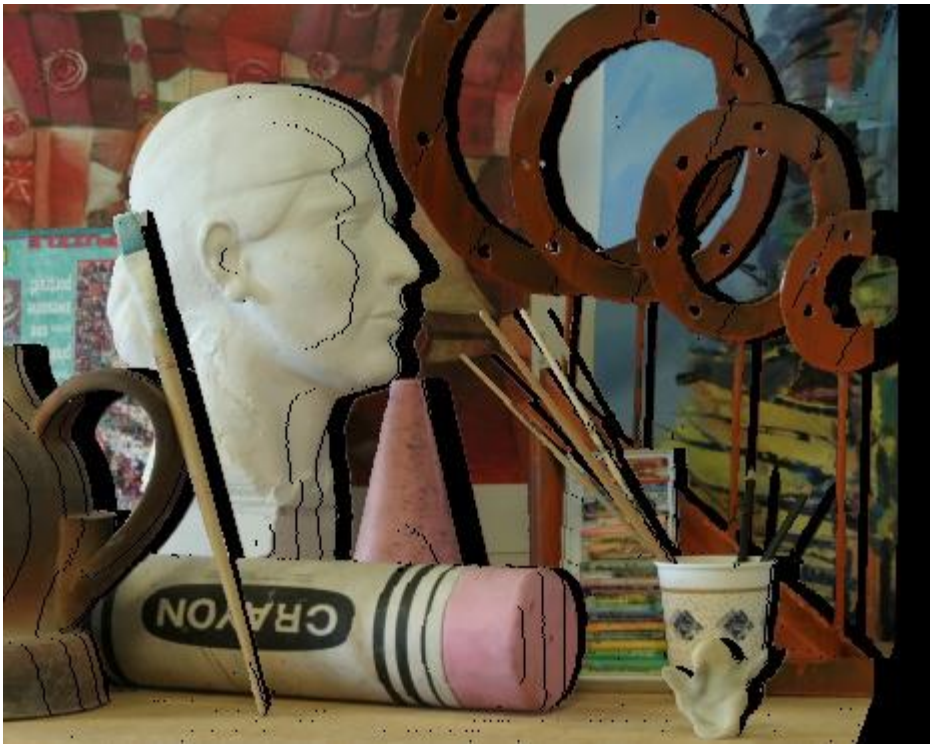
Output:

Left Disparity Image:

Right Disparity Image:

1.4 View Synthesis

Left View Synthesis: View3_Left with holes:



Right View Synthesis :

After populating the holes of Left View Synthesis from values in Right Disp Map:

2 Image Segmentation

Perform mean-shift segmentation on the image above. We use the simplest way to perform mean-shift as suggested by the reference textbook (Section 5.3.2) - Start a separate mean-shift mode estimate y at every input point x_i and to iterate for a fixed number of steps or until the mean-shift magnitude is below a threshold.

Original Image:

h = 30, iter = 40

h = 60, iter = 40

h = 90, iter = 40

h = 150, iter = 40