Assignment #4

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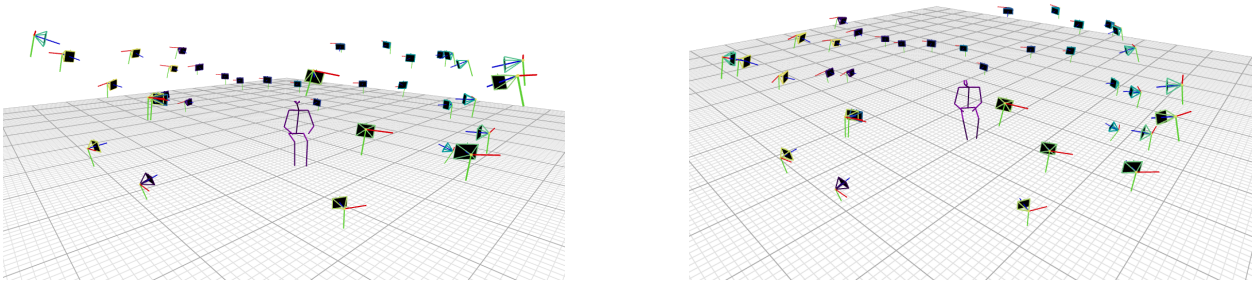
1 Single Person 3D Keypoint Reconstruction

In question 2 we constructed a code that make two-view triangulation and N-view triangulation. Below is the result of the code. More explicit information about code is written in the code itself.

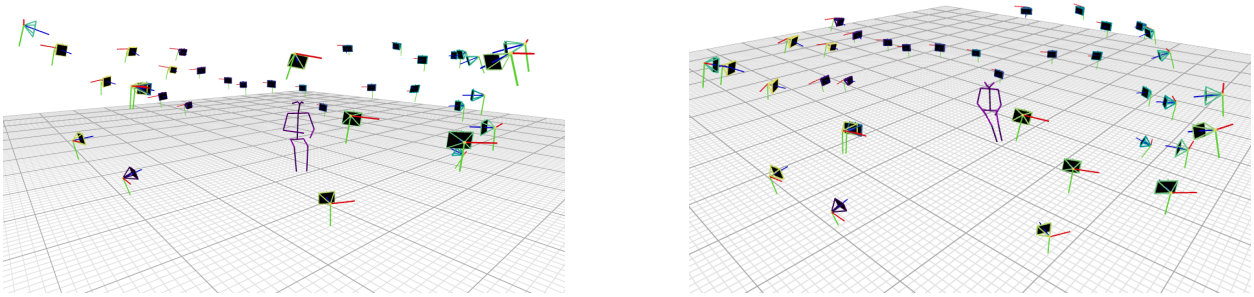
1-1. Two-view Triangulation



(a) single person 0 (b) single person 1

Figure 1: Result of the code

1-2. N-view Triangulation



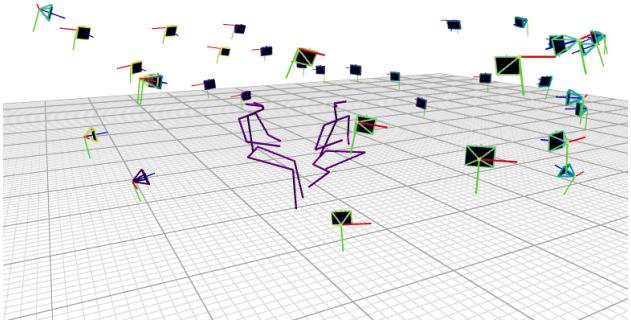
(a) single person 0 (b) single person 1

Figure 2: Result of the code

2 Two person 3D Keypoint Reconstruction

For two people and two camera views, all possible correspondences (2 combinations) are evaluated by computing the average reprojection error. Only keypoints with confidence scores above 0.3 in both views are used for triangulation and reprojection. Below is the result of the code, more explicit details are written in the code itself.

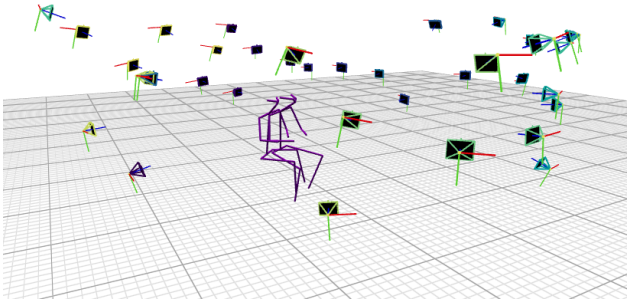
2-1. Brute Approach on Two-view



(a) two person 1

Figure 3: Result of the code

2-2. Brute Approach on N-view



(a) two person 1

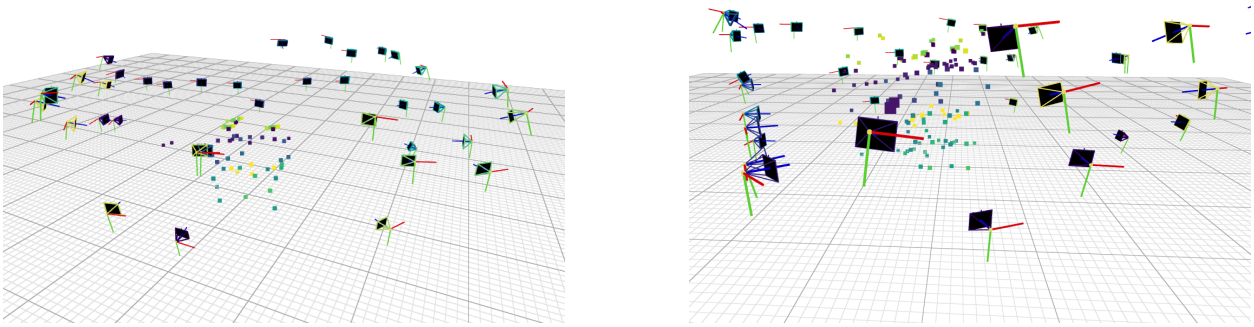
Figure 4: Result of the code

3 Multi Person 3D Keypoint Reconstruction

Question 4 consists of 4 steps, the explanation and the result of the code is shown as the below. the more explict explanation of the code is written in itself as the code above.

3-1. Node Proposals: 3D Joint Voting

4.1 Node Proposals: Generated 3D joint candidates by projecting 2D heatmaps from multiple views onto a voxel grid and applying NMS.

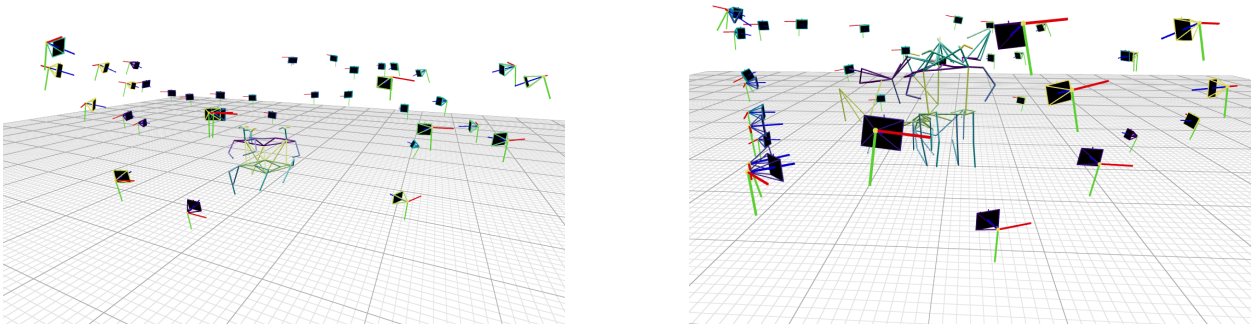


(a) two person 3 (b) two person 4

Figure 5: Result of the code

3-2. Part Proposals: 3D Bone Voting

4.2 Part Proposals: Computed 3D bone candidates by evaluating connectivity of projected node pairs across views using 2D detection consistency. To get the best output I changed the threshold a lot of times. The best output came out in 0.28 for two person 3, and 0.34 for two person 4 image.

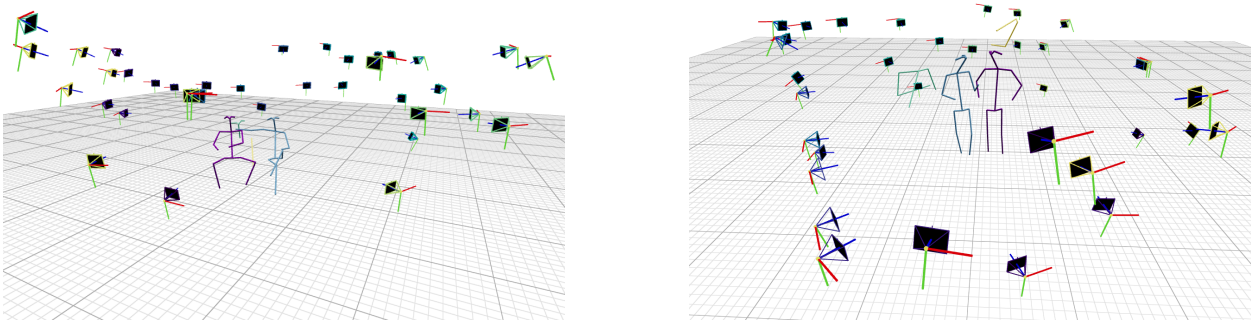


(a) two person 3 (b) two person 4

Figure 6: Result of the code

3-3. Skeletal Proposals: Using Dynamic Programming

4.3 Skeleton Proposals: Constructed full 3D skeletons by selecting high-scoring part combinations via dynamic programming and enforcing 2D-3D consistency.

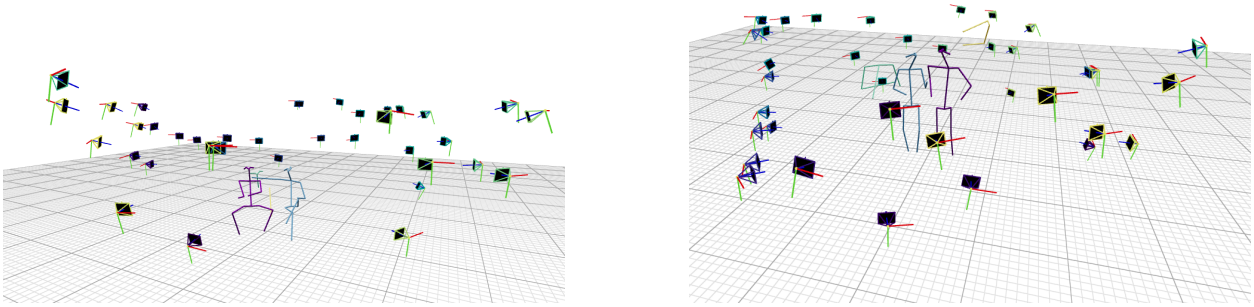


(a) two person 3 (b) two person 4

Figure 7: Result of the code

3-4. Skeletal Proposals: Refining Skeletons

4.4 Skeleton Refinement: Refined each 3D joint by minimizing reprojection error to corresponding 2D keypoints using gradient-based optimization.



(a) two person 3 (b) two person 4

Figure 8: Result of the code