Dynamic fusion

大学共同利用機関法人 情報・システム研究機構
国立情報学研究所
National Institute of Informatics

Internship Week 18
Segmented Fusion
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Inoë ANDRE

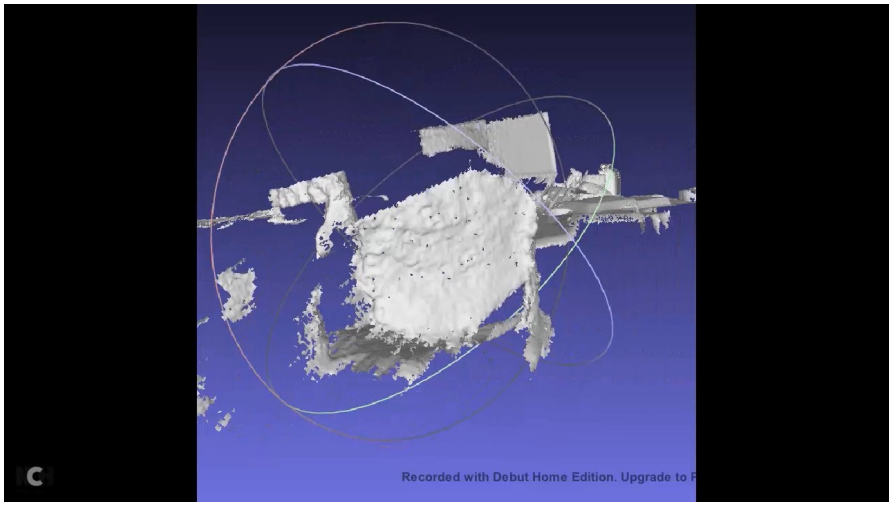
Advisors : Prof. A.Sugimoto
Ass.Prof. D.Thomas

Last meeting

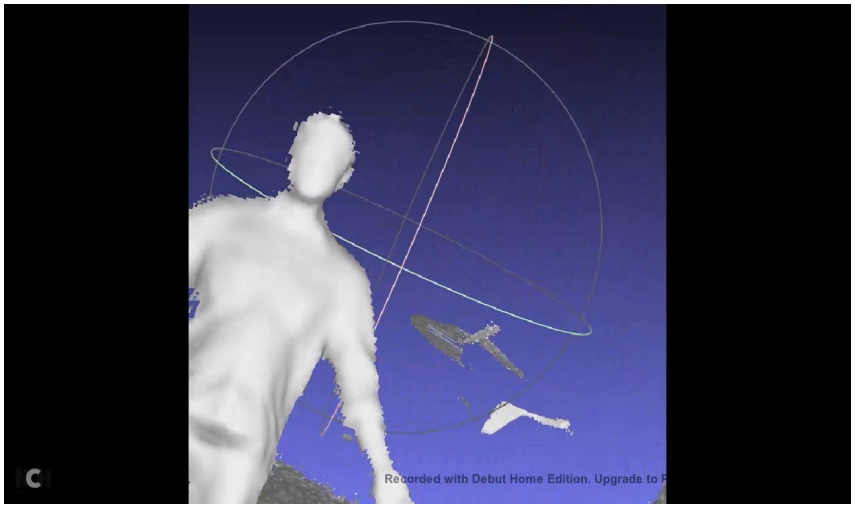
- Previously
  - Coming back to former mesh tracking
  - Change dataset
  - Fusion does not work when there are new images
- Plan for today's meeting:
  - Mesh Tracking
  - Fusion
  - Segmented fusion

Progress

- Mesh tracking



Fusion 3-59 Images from TUM's dataset



Fusion 0-19 Images from Nguyen's dataset

Progress

- Reason : double unnecessary inverse
  - Inverted Mesh tracking result
  - Inverted TSDF Input pose to transform volume

Progress

- Algo pose T point of view:

1) T = identity

2) Align current image with updated mesh.
   Output: T = transfo from mesh to current image

3) Put T in TSDF to transform and project Volume in the current image.

4) Update mesh with the new TSDF

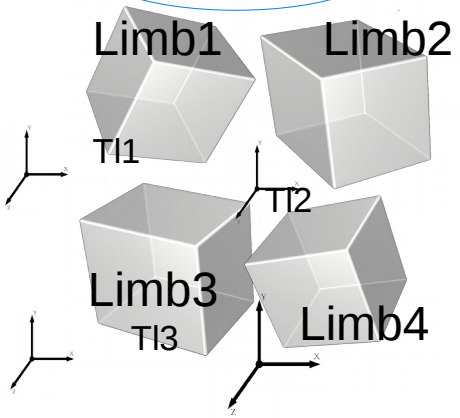
5) Go back to 2) until there is no image.

Segmented Fusion Pipeline

0 Bounding Box (PCA)

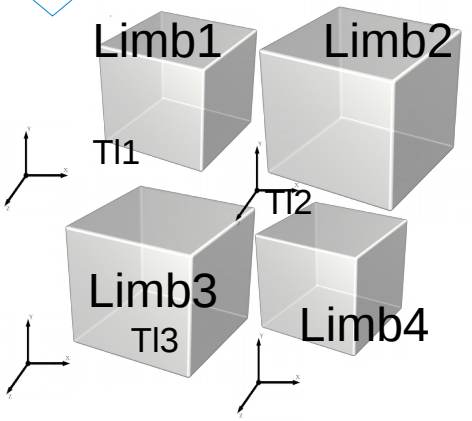
Compute dimensions

1 Create Volumes



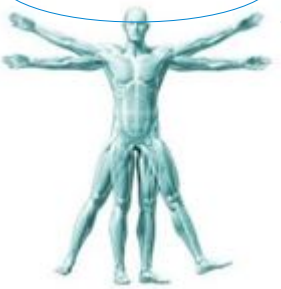
Local to Global coordinates

2



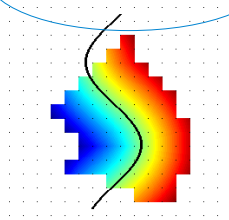
Transform in current pose

3 Align Pose

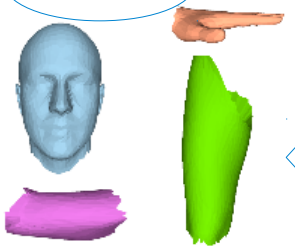


Projection in current image

4 TSDF Fusion

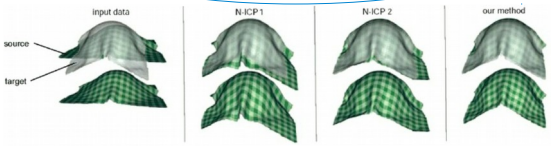


5 Mesh



6 Assembling mesh

7 Rigid Alignment



End of 1

Progress

- Algo for each segmented part

  1) Transform the local body part coordinate system into the global coordinate system

  2)Projection in current image

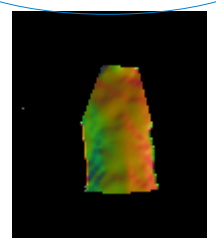
  3)Fuse (TSDF)

  4)Marching Cube

- Then put all the mesh in one global mesh
- Do the alignment with this global mesh.

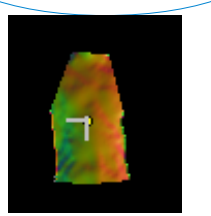
Pipeline local transform :

0 Get limb's points of cloud

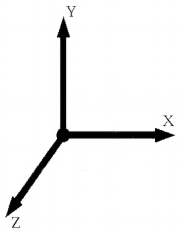


PCA

1 Fit the points of cloud



2 Get Eigen Vectors



Put them a matrix with the origin (= a corner)

e1	e2	e3	center
[[0.540	0.791	-0.286	1.037]
[0.798	-0.589	-0.123	0.391]
[0.266	0.162	0.949	3.762]
[0.	0.	0.	1.]]

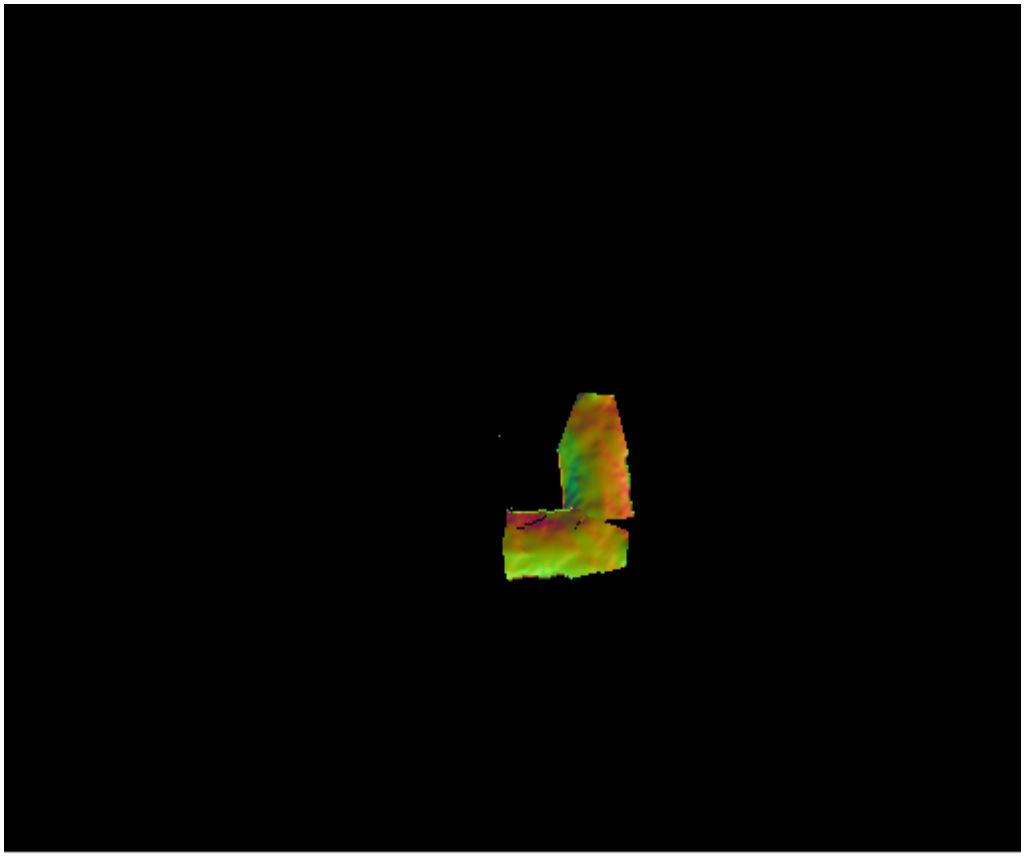
3 Global to local transfo

Inverse transformation

[[0.540	0.798	0.266	-1.876]
[0.791	-0.589	0.162	-1.200]
[-0.286	-0.123	0.949	-3.227]
[0.	0.	0.	1.]]

4 Local to Global transfo

Pipeline local transform :



Transformation of the torso with the local transformation

The torso which is below : transformed torso.
The other torso : torso in global coordinates system

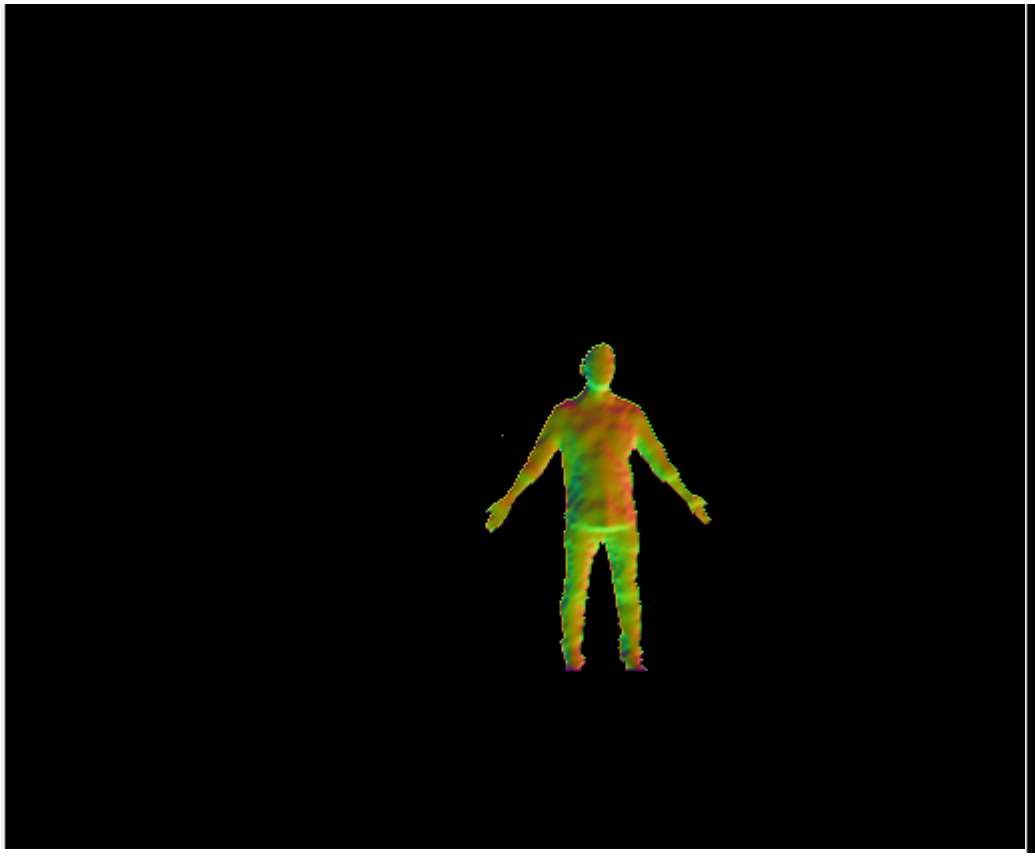
Other tries :

- use directly the transform method on the point of cloud in pca => black image
- Use the transform method on Identity to get local transform. => deformations

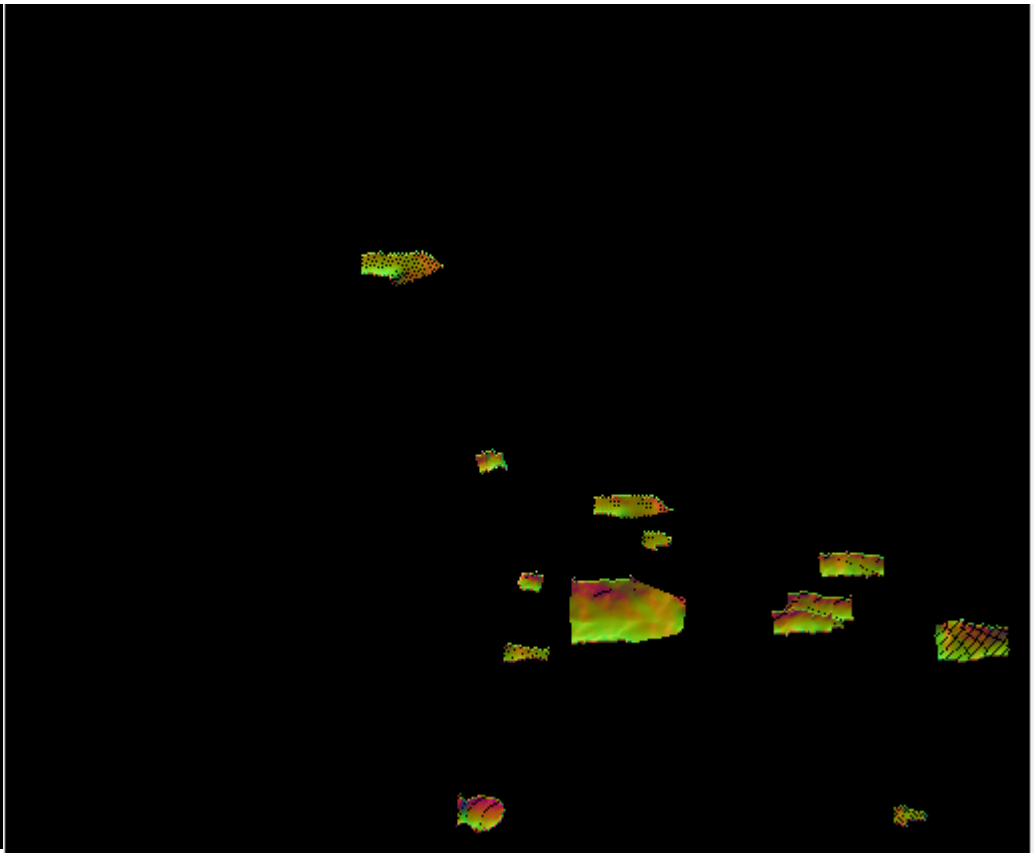
Input : Torso in global system
Output : Torso and its transform in the local system

Pipeline local transform :

Doing the same but for all body part

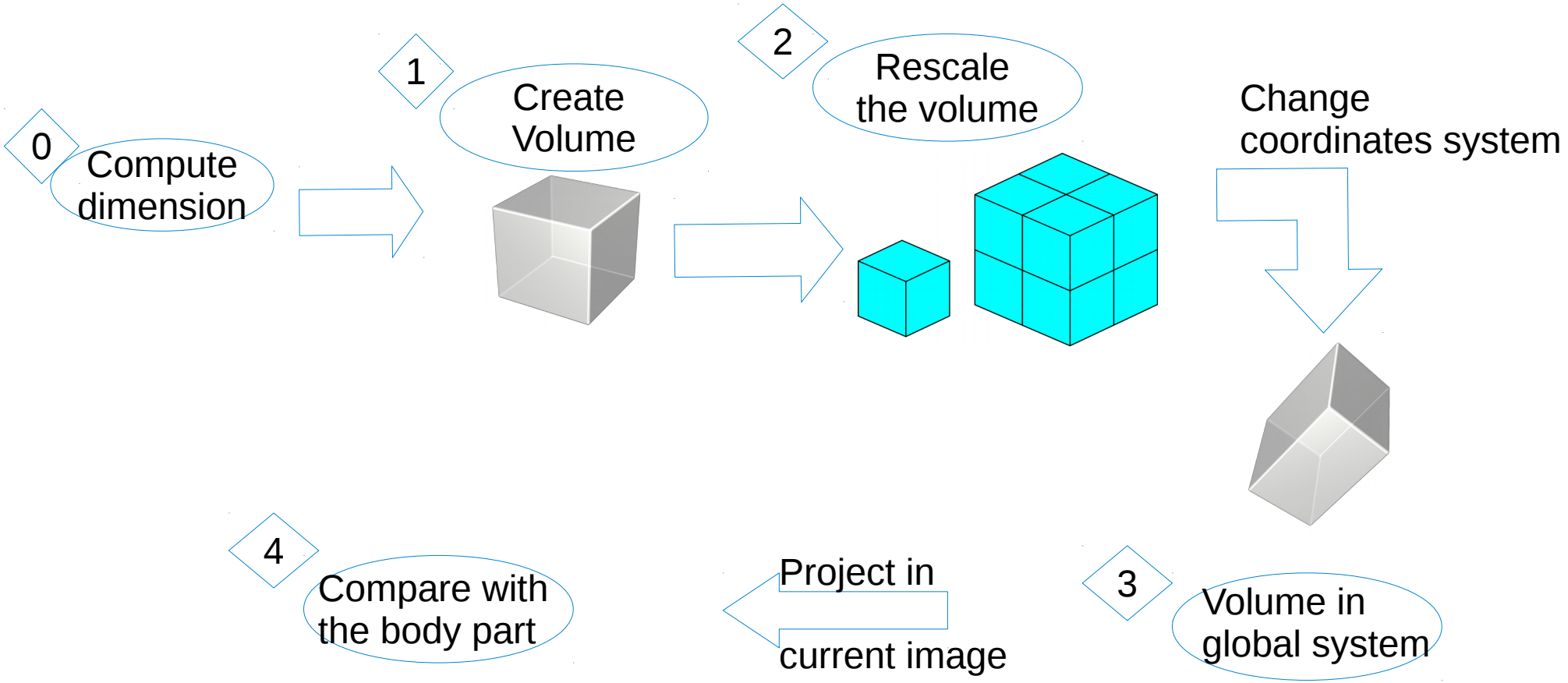


Visualization of all body without transfo.



Local Transfo of all body part
At least all part are in the image

Transform Volume:



Volume:

Creating a point of cloud and visualize it

Idea :
Create a point of cloud of the space of body part.
Transform it
Overlay it with the body part it self

No Input
Algo : Compte dimension of torso
Create an image of size of torso with random normales
Output : the image just created

Progress

- Research papers: Stitching puppet
  - Goal :
    - Faust mesh alignment
    - Estimating pose and shape of complex body movements

SP
- SCAPE Model
- 16 body parts
- Limbs : Blow up, transform (canonical, shape and Pose) then stitching
- Stitching potential done manually with weighted sum of square
- Alignment : use of stitching term

Our work
- Generated Model
- 14 body parts (shoulders missing)
- Already separated, transform and add together

Action plan

- Read papers : conceive algo
- Fusion for each segmented body part separately:
  - Local transform
  - Coordinates change one by one
  - Fuse one by one
  - Align globally

Q&A

- Stitching puppet code available: shall I use it?