

# Dynamic fusion

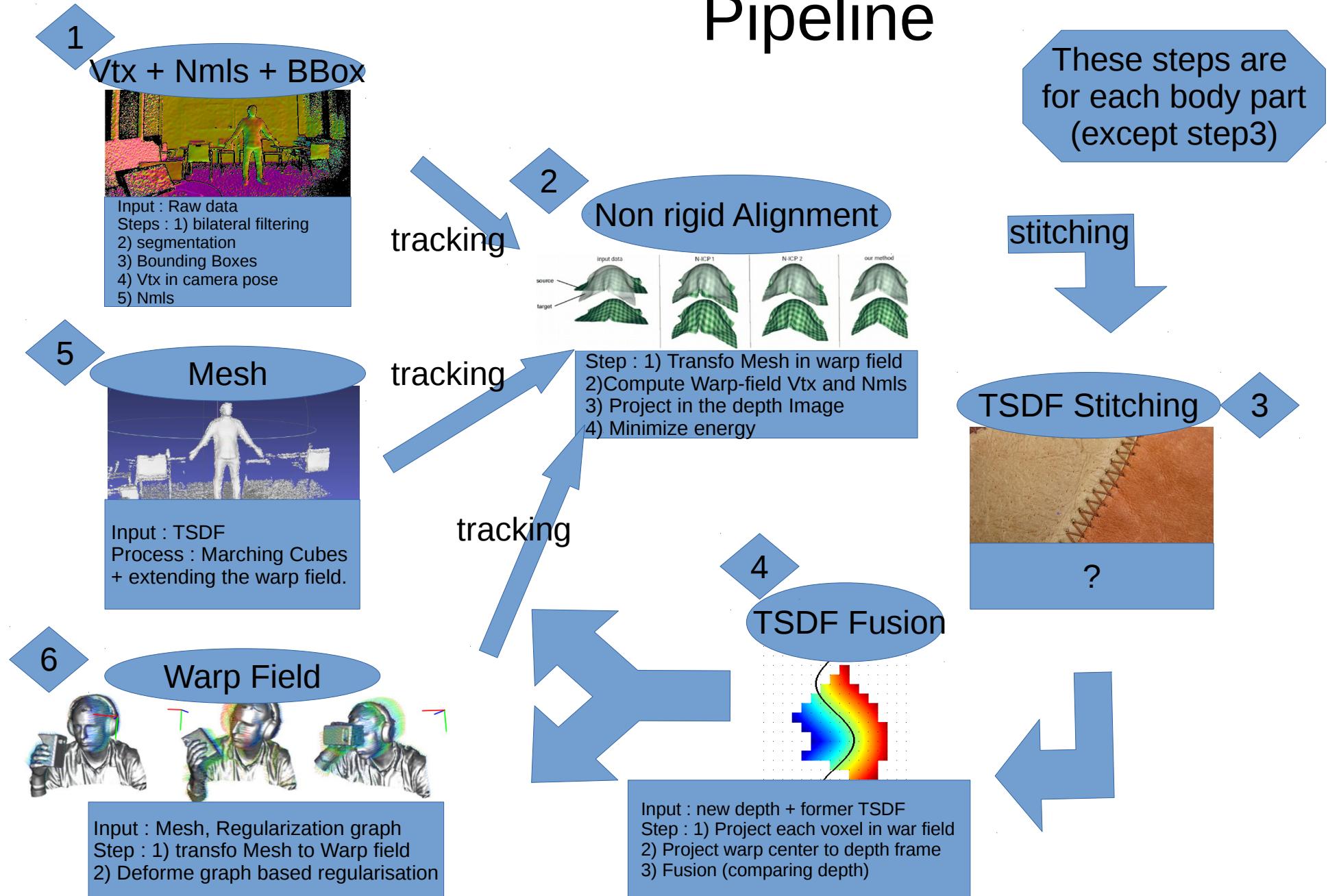


Internship Week 13  
Tracking Mesh and Fusion  
19 May 2017

# Last meeting

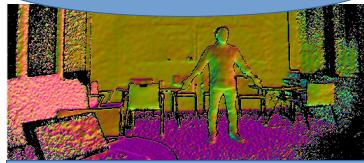
- Previously (half period)
  - Marching Cubes redone
  - Generate good rendering from Marching cubes' vertices (only).
  - Tracking with following frame in time
  - Fusion but tracking just with older frame not with Mesh
  - Fusion with Mesh in process (need to compute normals)
- Plan for today's meeting:
  - Pipeline
  - Tracking with Mesh
  - Segmented Fusion

# Pipeline



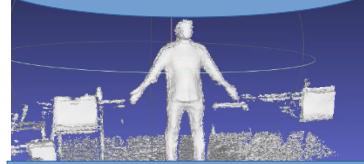
# Current state Pipeline

Vtx + Nmls + BBox



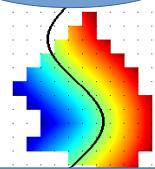
Input : Raw data  
Steps : 1) bilateral filtering  
2) segmentation  
3) Bounding Boxes  
4) Vtx in camera pose  
5) Nmls

Mesh



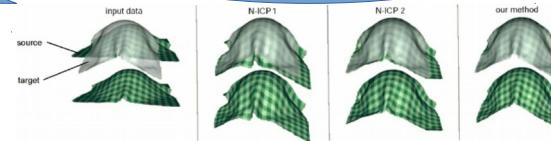
Input : TSDF  
Steps : Marching Cubes

TSDF Fusion



Input : new depth + former TSDF  
Step : 1) Projection of 3D space  
in camera view per voxel  
2) Compare depth

rigid Alignment



Input : new depth + Mesh  
Step : 1) Transfo Mesh with Current Pose  
2) Project Mesh in Depth frame  
3) compare vertexes and normals  
4) Add correspondence and compute ICP.

# Progress

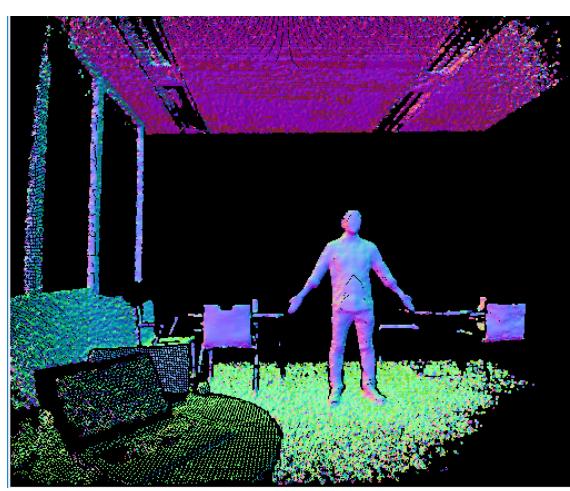
- Meshes Normals:
  - What I first understood
    - (1) For one face compute its normals
    - (2) On the following face, compute its normals and sum it to the former normals. Repeat it for all faces.
    - (3) Meanwhile, for each face, put the current sum of normal on the vertex of the face
    - (4) Normalized

# Progress

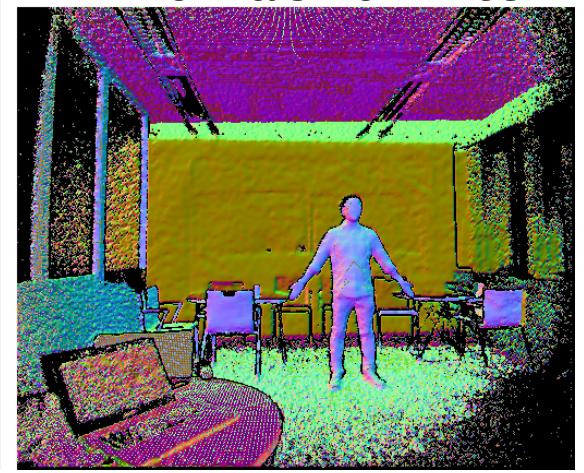
- Meshes Normals:
  - Algo for each face:
    - 1) Get face's normal (cross product)
    - 2) Add this normal to the vertices' normal of the face.
    - 3) Once it is done for all face, normalize every normal
  - Compute once all Vertexes are computed outside GPU.



type = int



type = float

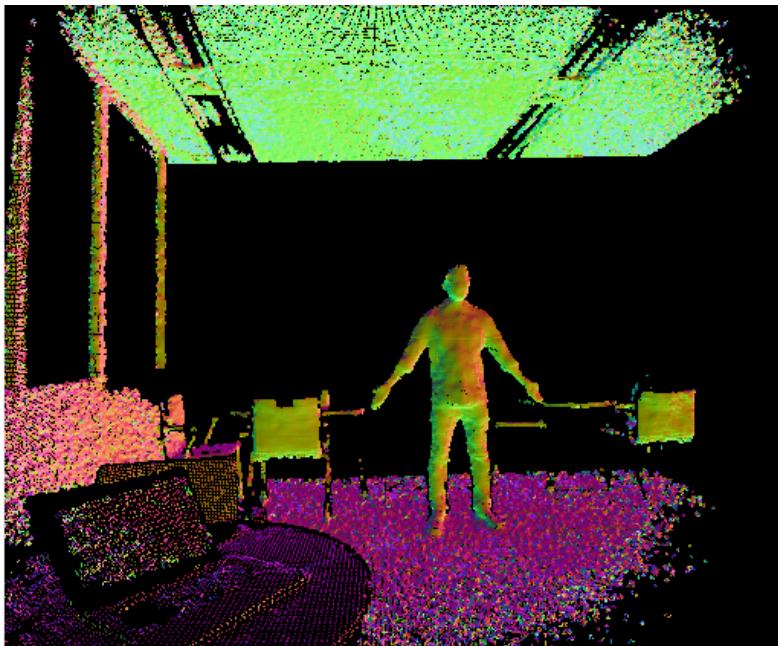


Overlay of Depth and  
normals from Mesh

# Progress

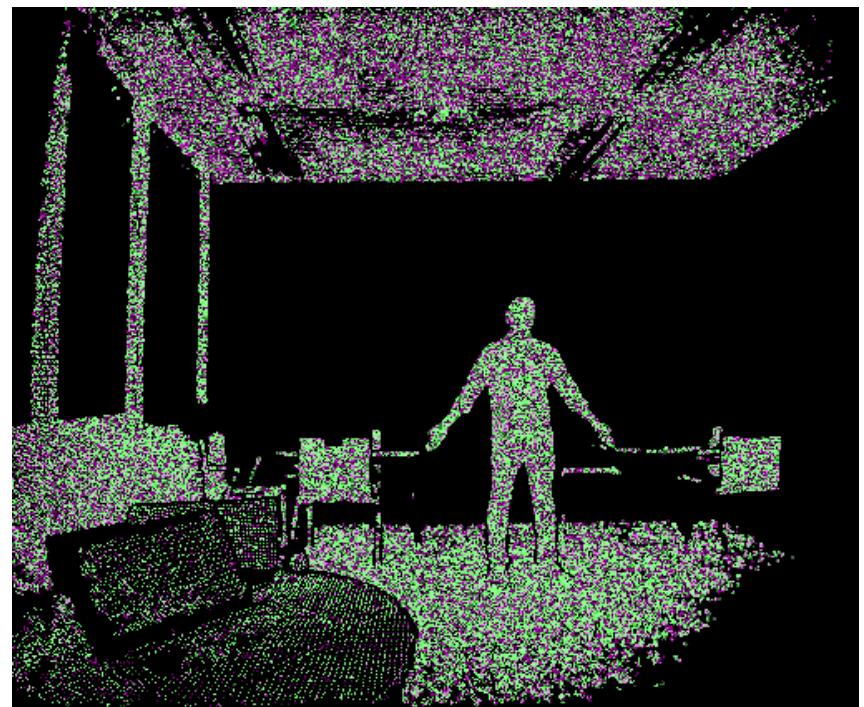
- **Meshes Normals:**

Normals from Mesh non inverted faces  
normals



Rendering image from MC's outputs

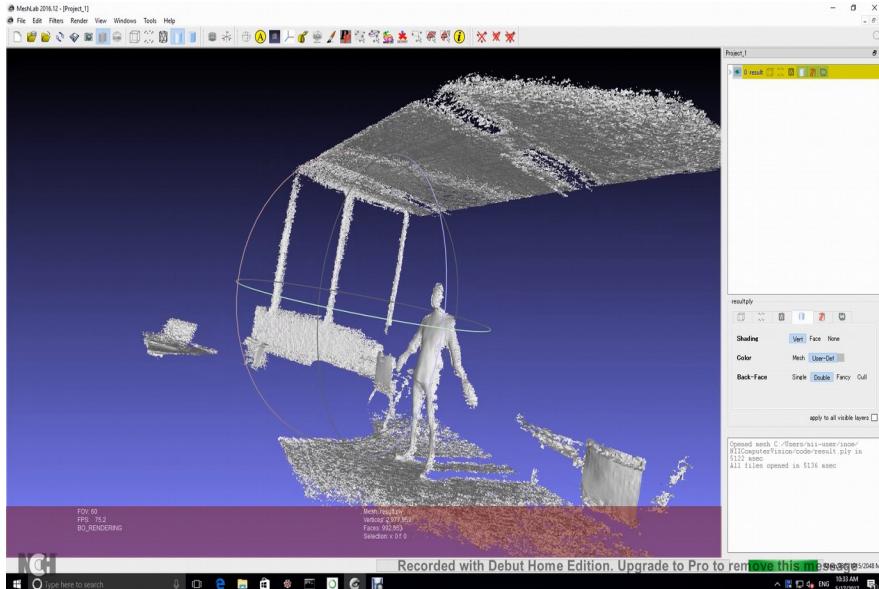
Normals From Mesh computed in GPU directly



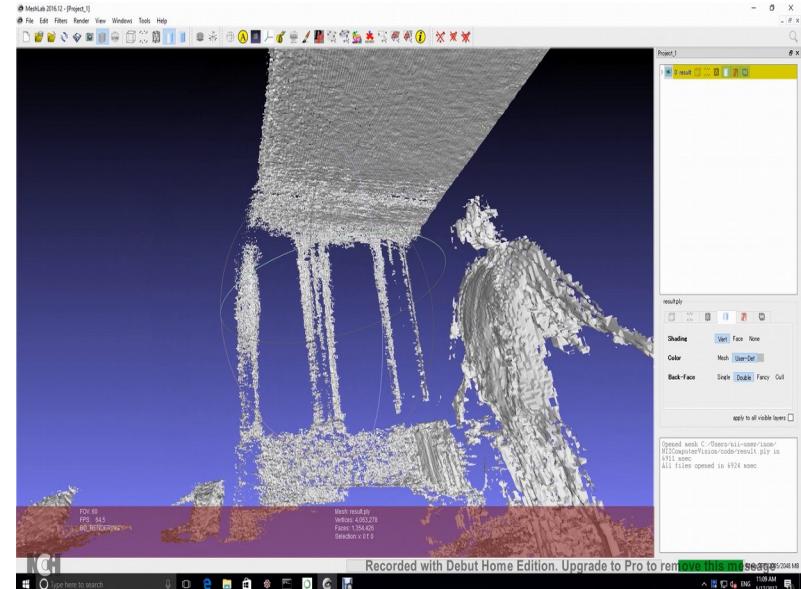
Mean of adjacent faces normals

# Progress

- Tracking with the Mesh



Fusion 5 images



Fusion 20 images

# Progress

- Tracking with the Mesh
  - 1) Transform Mesh with current Pose
  - 2) Projection Vtx of Mesh in current depth frame
  - 3) Compare Vtx
  - 4) Compare Nmls
  - 5) Add correspondence to matrix
  - 6) ICP

# Progress

- Tracking with the Mesh
  - Compute the indexes of the 2D space from MC's Vertexes
  - Transform these in camera view (intrinsic)
  - Check the values
  - Use these indexes in the MC's Vertexes and normals to compare the vertexes and normals of the new frame.

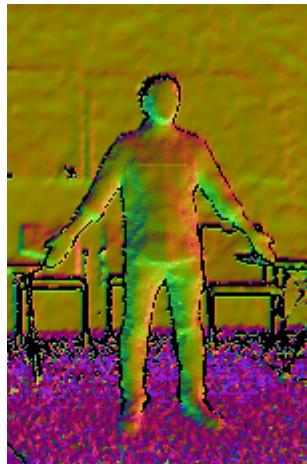
# Progress

- Tracking with the Mesh
  - First wrong Normals computation  
=> Not enough correspondence to compute the Pose estimation.
  - Project Mesh in new image ?
    - Compute the indexes of the 2D space from MC's Vertexes
    - Transform these in camera view (intrinsic)
    - Use these indexes in the new depth image to compare the same vertexes and normals.

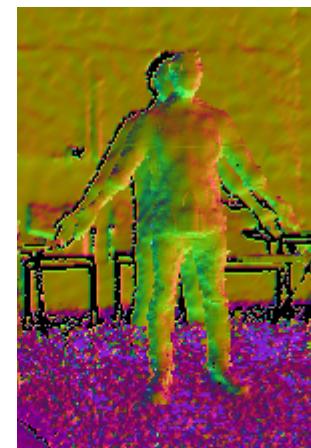
# Progress

- Tracking with the Mesh
  - Projection of depth in Mesh

Overlay depth Image with new pose & new image MC's depth map



Tracking with depth images



Tracking though Mesh

# Progress

- Upgrade of GPU code by Diego

# Action plan

- Finish Tracking Mesh
- Global Fusion
- Then Fusion for each segmented body part separately:
  - Coordinates change one by one
  - Fuse one by one
  - All together

# Q&A

- How was the presentation today? How can I improve it?
- Experience : movement?
- Would it be easier to have a hardware that gives the position of the camera?
- Key words for stitching research papers?