Dynamic fusion

国立情報学研究所
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Internship Week 6
Bounding Boxes and Segmentation
31 March 2017

Last meeting

- Previously
  - Presentation of Kinect Fusion.
  - Segmentation data from kinect
  - Cropped
- Plan for the week:
  - Presentation 1 part of Dynamic Fusion
  - Bounding Boxes (output = Transform and size)
  - Segmentation of hand and feet
  - Optimize ray tracing

Dynamic Fusion
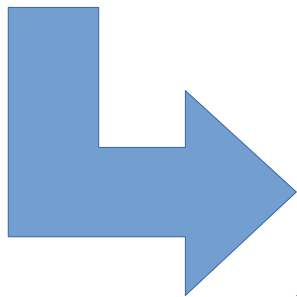
- From rigid body to motion

Kinect Fusion

(a) Initial Frame at $t = 0s$

(d) Canonical Model

Dynamic Fusion

(e) Canonical model warped into its live frame

Dynamic Fusion

- Motion Field

  - Node structure $\mathcal{N}_{\mathbf{warp}}^{t} = \{\mathbf{dg}_v, \mathbf{dg}_w, \mathbf{dg}_{se3}\}_t$.

  (c) Node Distance

  - Sparse transformation $\mathbf{D\tilde{Q}B}(x_c) \equiv \frac{\sum_{k \in N(x_c)} \mathbf{w}_k(x_c)\hat{\mathbf{q}}_{kc}}{\|\sum_{k \in N(x_c)} \mathbf{w}_k(x_c)\hat{\mathbf{q}}_{kc}\|}$

  - Interpolation

  - Update position and normal

  - Global transform

  $\mathcal{W}_t(x_c) = \mathbf{T}_{lw} SE3(\mathbf{DQB}(x_c))$

Dynamic Fusion

- Surface : update canonical model (TSDF)

  - Step1 : projection x_c fixed to live

  - Step2 : projection live to depth

  - Step3 : compare values of voxels and surface.

  $$\mathbf{psdf}(x_c) = \left[\mathbf{K}^{-1} D_t \left(u_c \right) \left[u_c^\top, 1 \right]^\top \right]_z - [x_t]_z$$

  - Step4 : TSDF Fusion with greater incertitude.

  Fusion : instead of taking all nodes as weight, just take the k-nearest node.
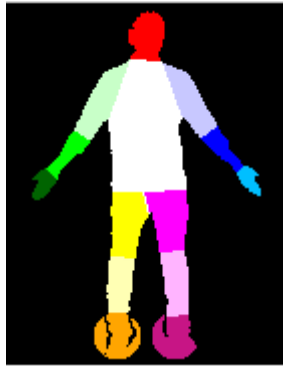
Dynamic Fusion

- Estimation of new motion field state

  - Mesh creation from TSDF

  - Project in live frame estimation of canonical

  - Project new frame to canonical

  - Point-plane:minimize the distance of each estimated point to the tangent plan of the corresponding point in the new canonical frame.
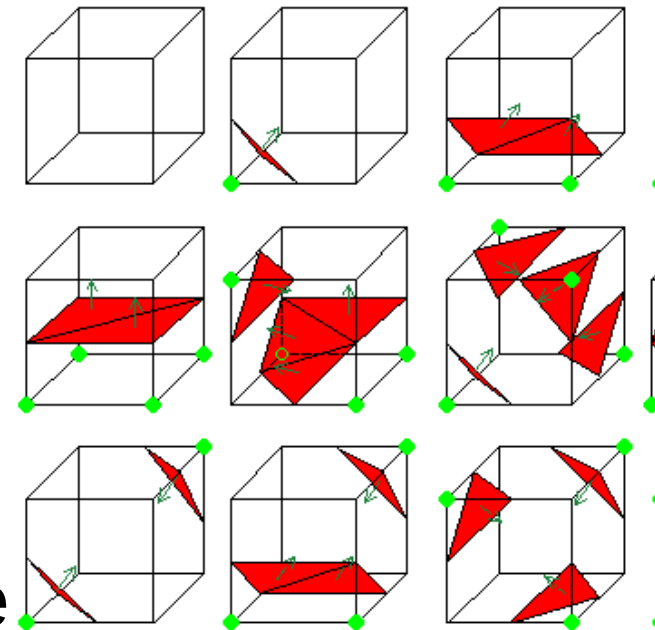
Progress

– Segmentation of hand and feet

Floor

No floor

Depending on the image there will be the floor. Idea uses the RGB images from the Kinect to get contours (with Canny or Deriche filter). Need to get new data with RGB image.

Progress

- Coordinates change has been coded but need some corrections

- Bounding boxes : try to install OBB_Maya or trimesh Librairy

- Optimize raycasting done by Diego but cannot run it since I do not have opencl yet.

Action plan

- Bounding Boxes

- Coordinates changes

- Presentation : Last part of dynamic Fusion

Q&A

- Frame 40 wrong skeleton due to Kinect

- Frame 30 hard time thresholding

- "This TSDF technique greatly simplifies the non rigid reconstruction process over methods where all frames are explicitly warped into a canonical frame."?

- Regularisation : do I need to understand Tukey and Huber?

- Rastering rendering pipeline?