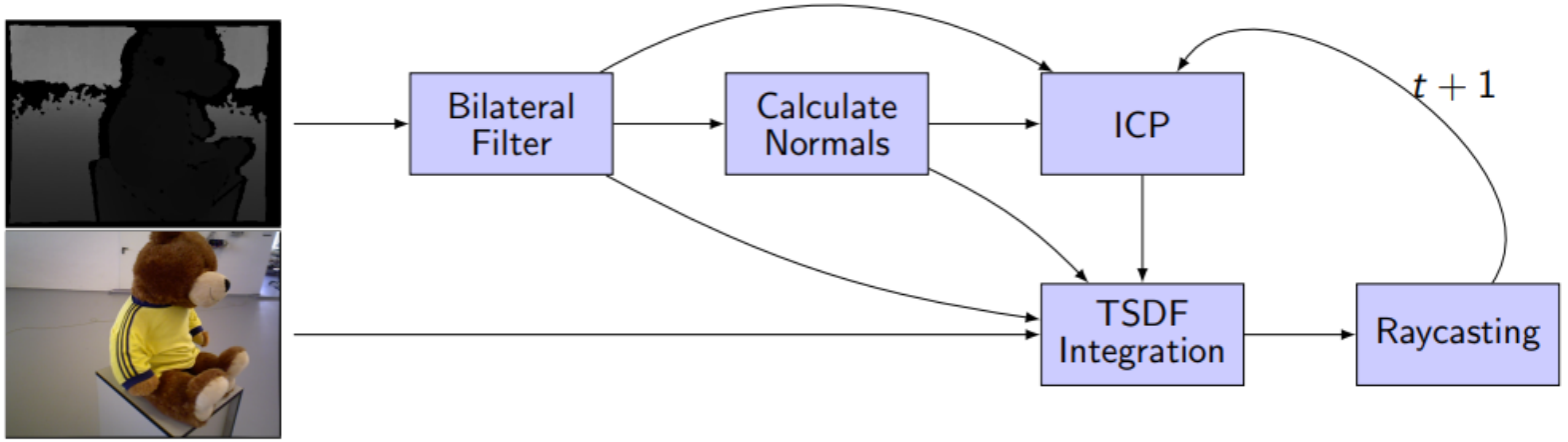
Mapping-TSDF

April. 14, 2019

김하영

3D Reconstruction

- From (RGB-)D images to 3D voxel grid



[Martin Herrmann] TSDF Volume Reconstruction (https://vision.in.tum.de/_media/teaching/ss2015/gpucourse_ss2015/kinectfusion.pdf)

3D Reconstruction

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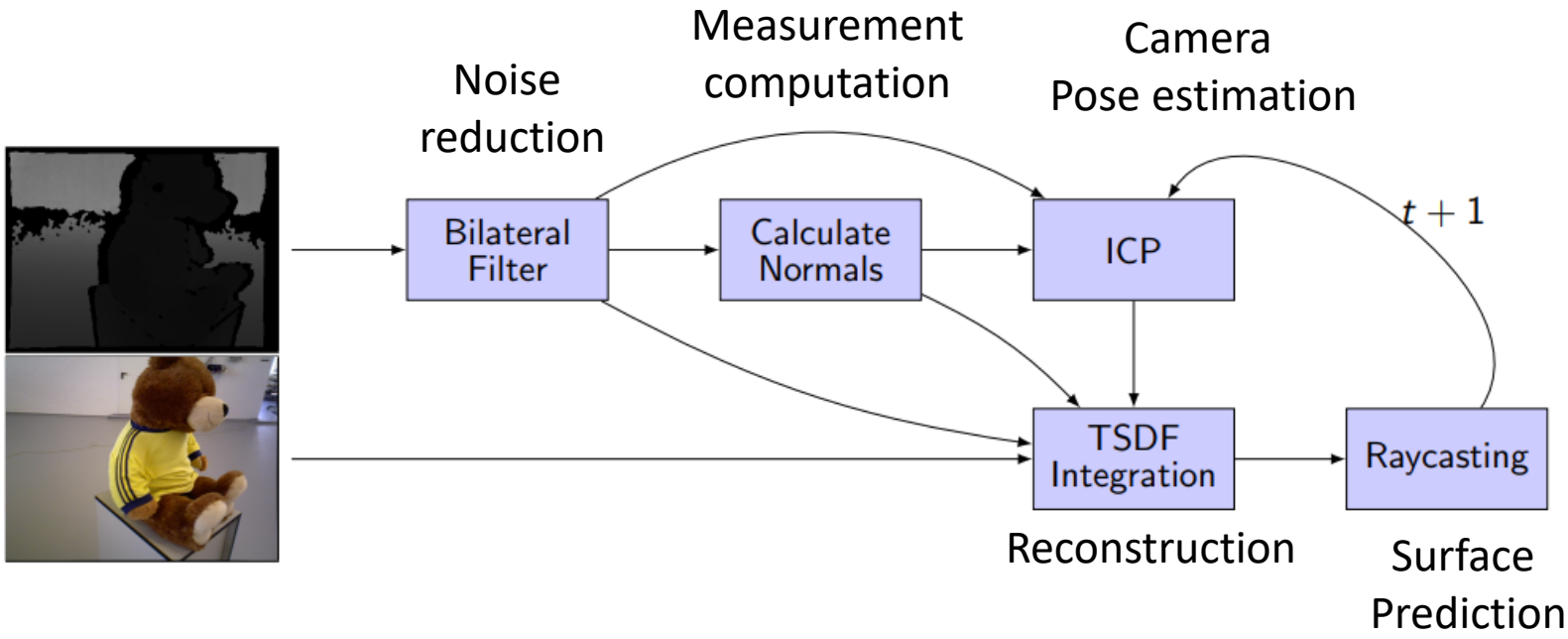

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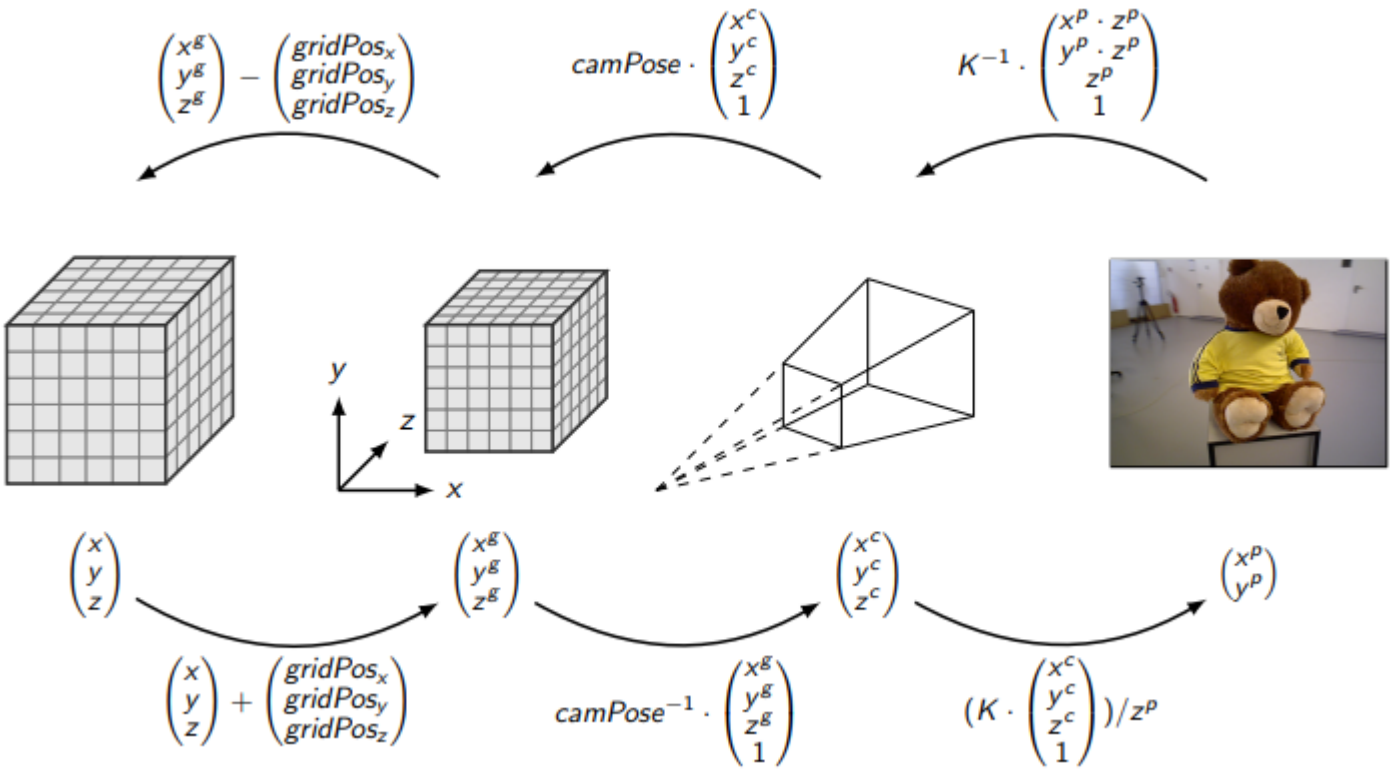
Transformations between the different coordinate systems



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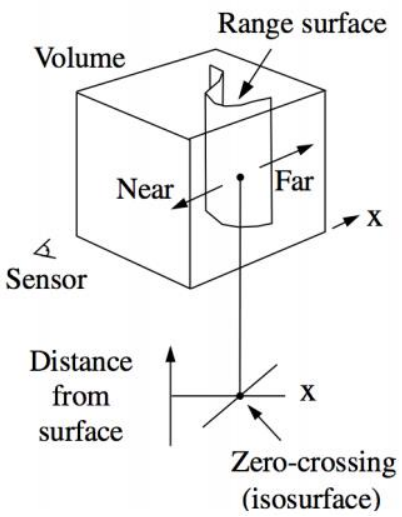
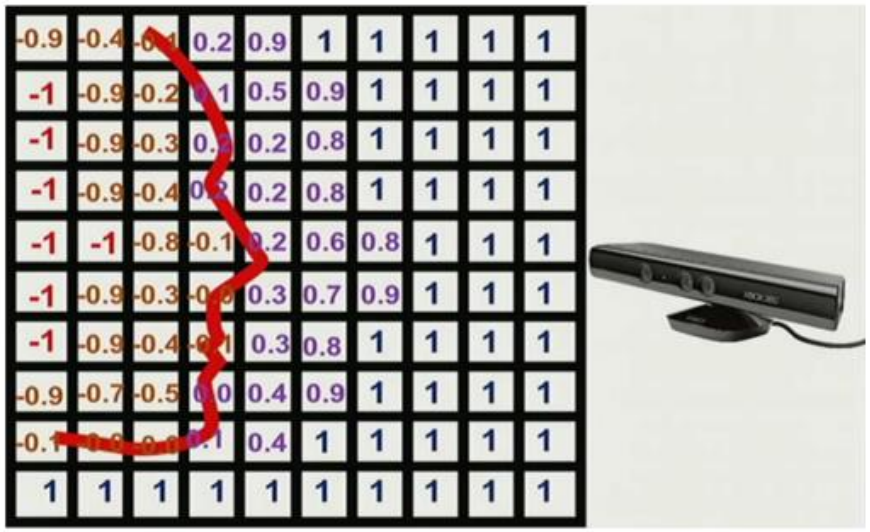
TSDF

- Truncated Signed Distance Function (TSDF)
  - Signed distance function
    - Distance of the closest zero crossing (surface)
  - Truncated signed distance function
    - Subtract it from the distance of the voxel itself and divide by the truncation threshold





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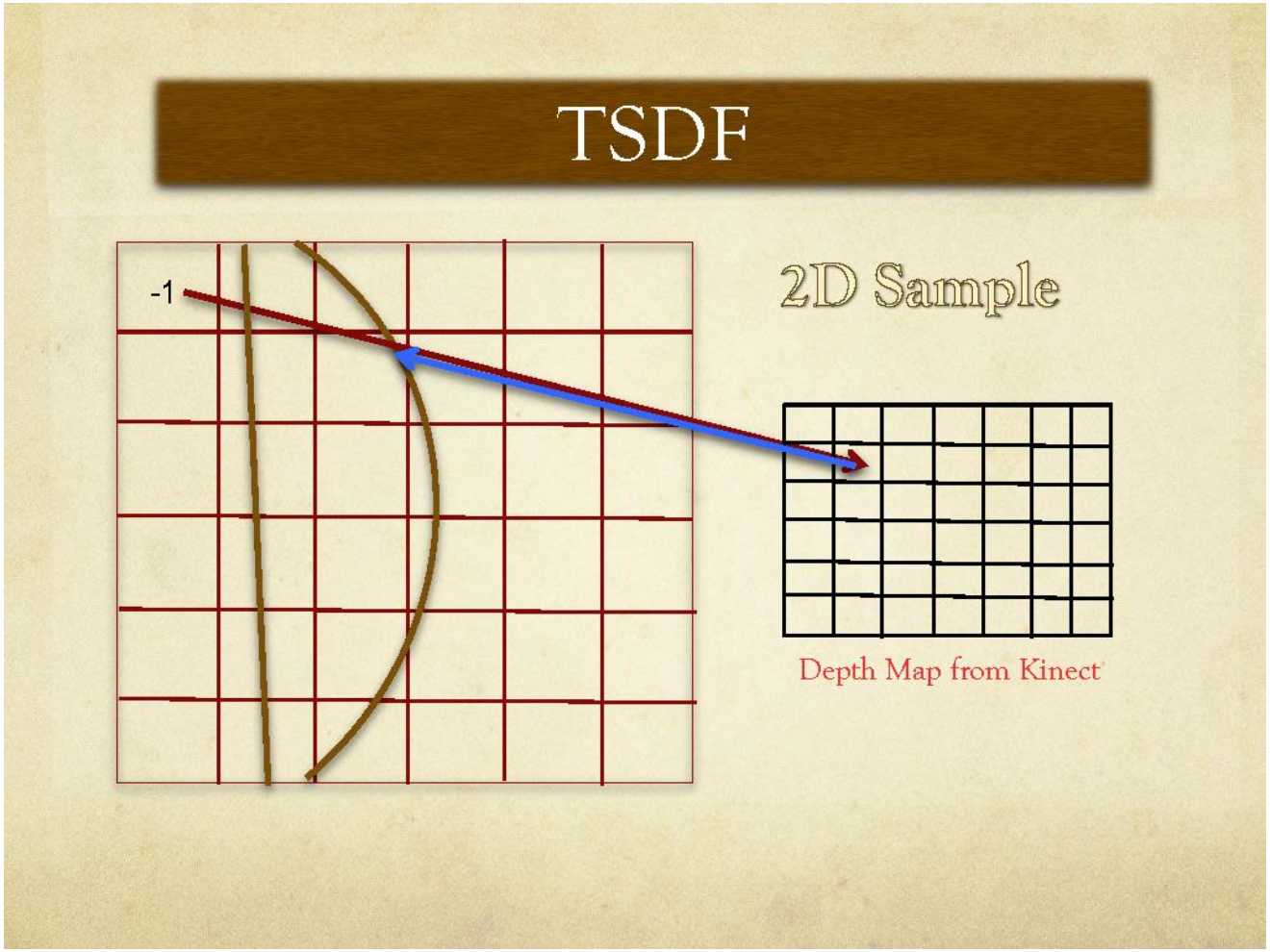
TSDF

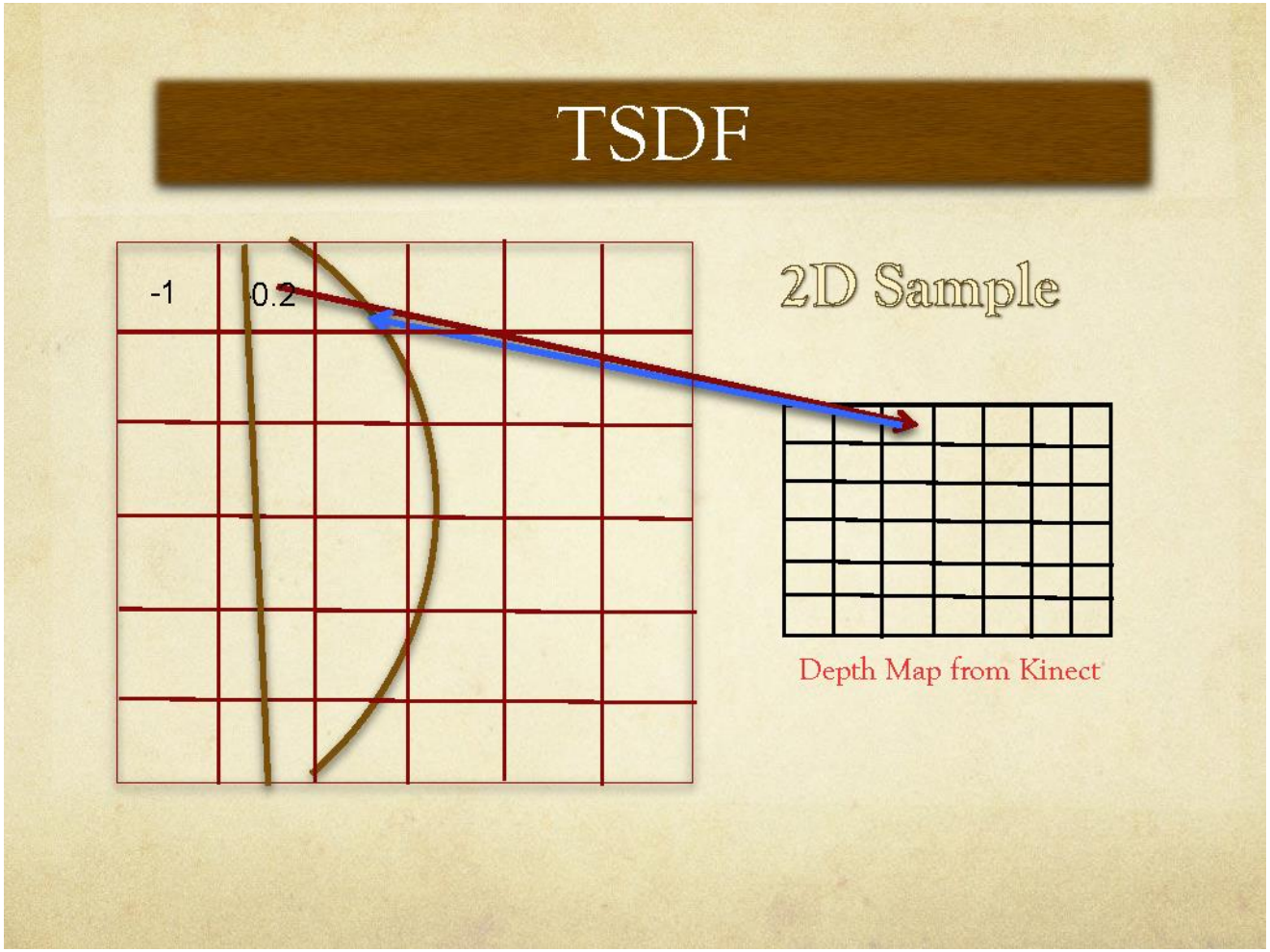
- Build TSDF



[Jiakai Zhang] 3D Reconstruction (https://cs.nyu.edu/courses/fall12/CSCI-GA.2945-001/dl/jiakai-slides.pdf)

TSDF

- Build TSDF



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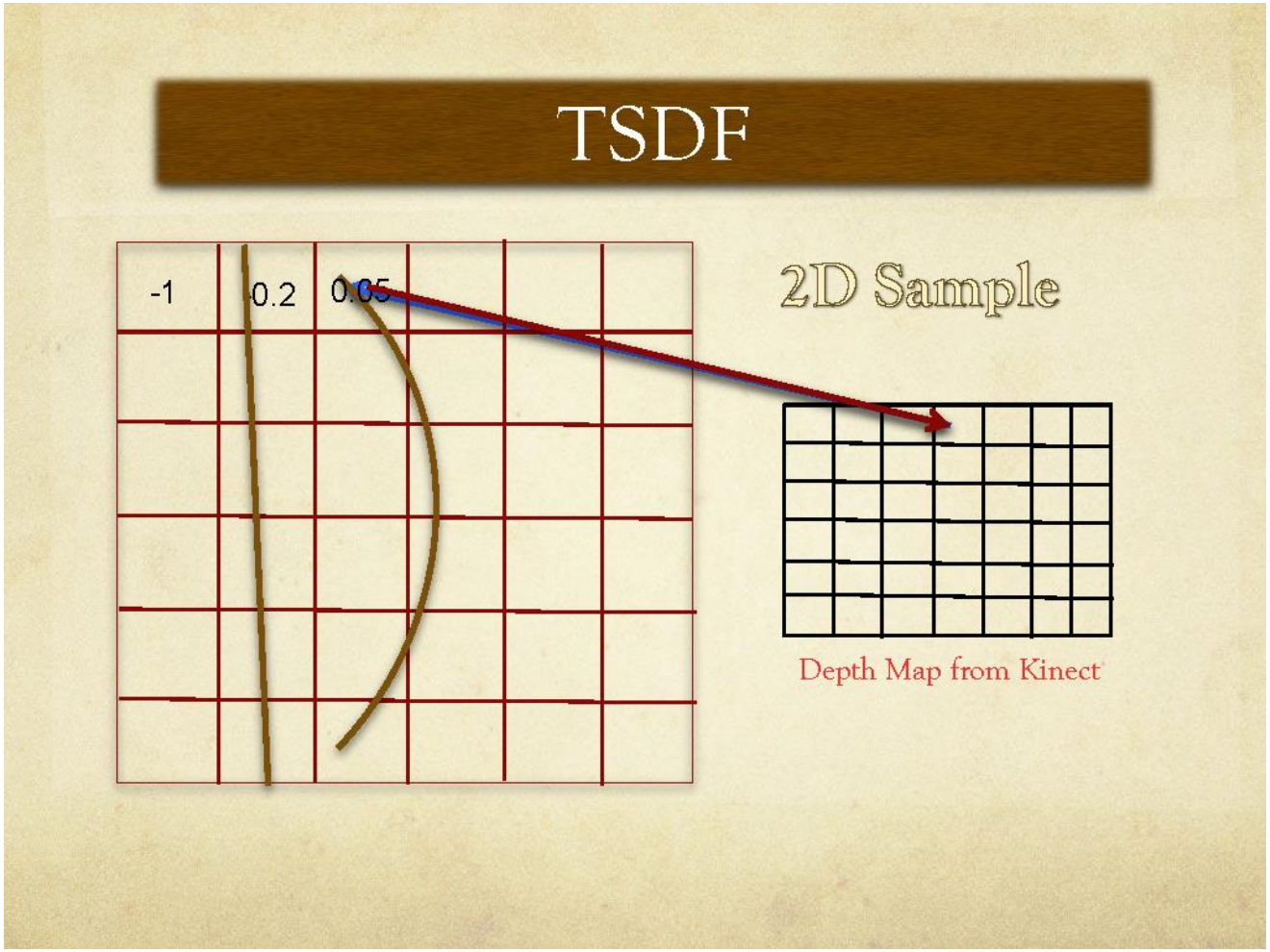
TSDF

- Build TSDF



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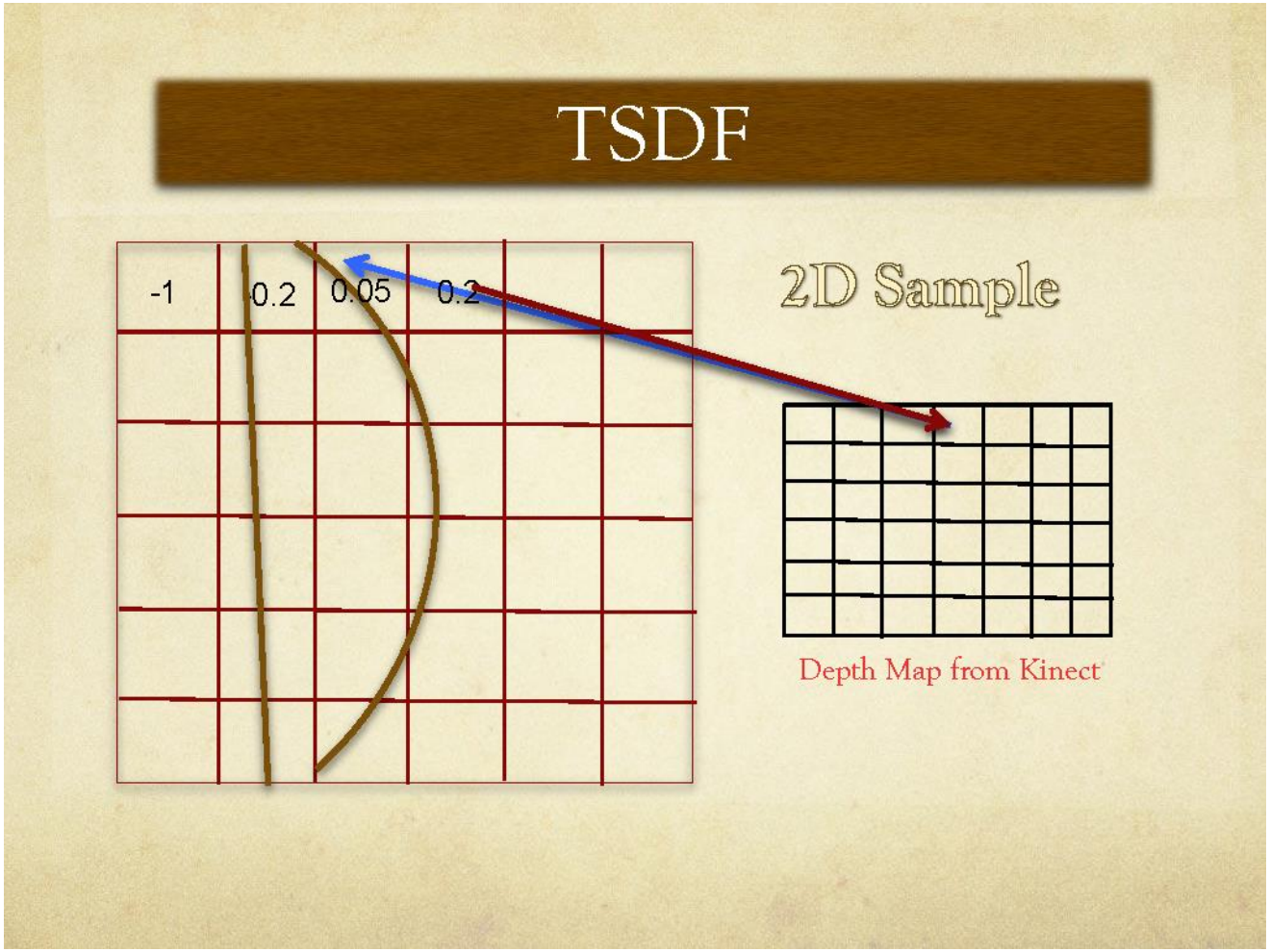
TSDF

- Build TSDF



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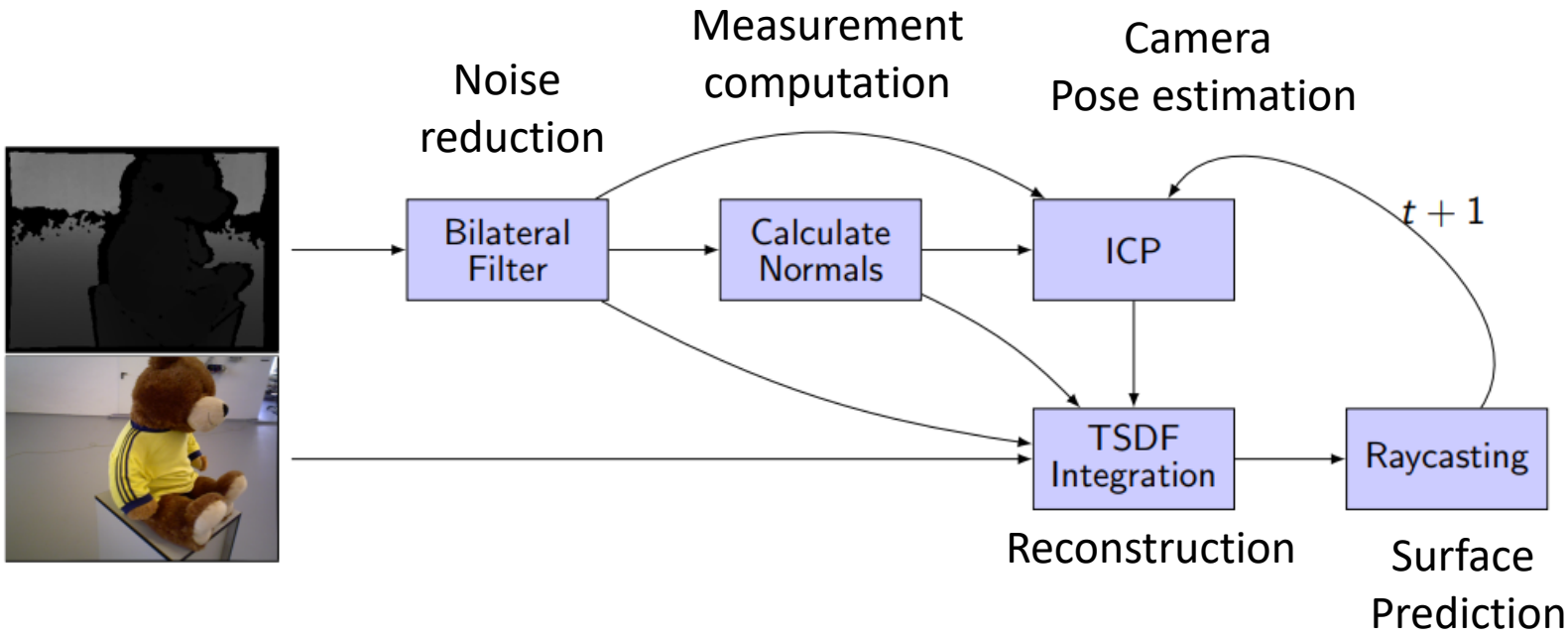
Overview

- From (RGB-)D images to 3D voxel grid



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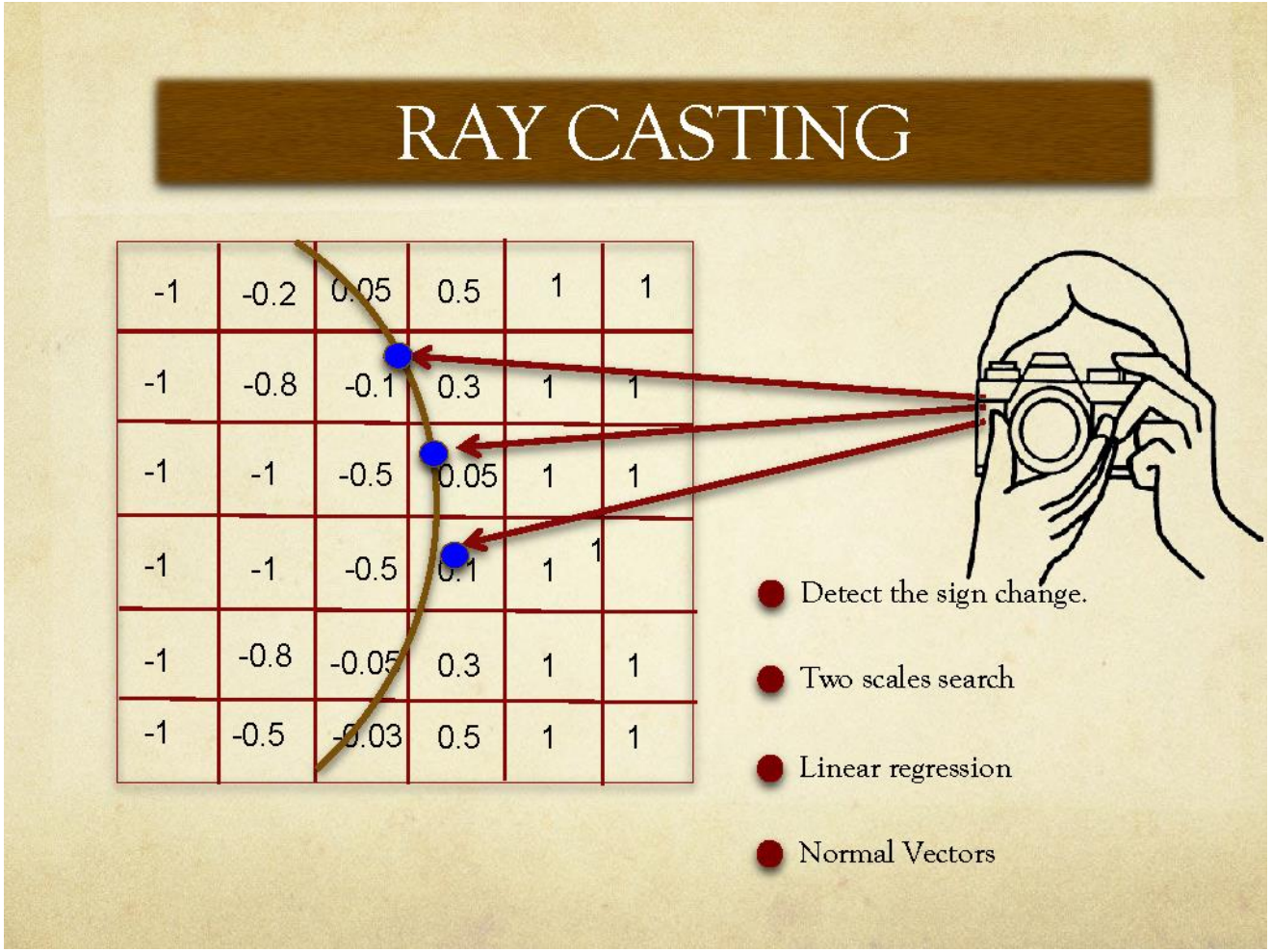
Raycasting

- From TSDF Voxel map to normal vectors



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Results

Exponential falloff

Linear falloff

No falloff

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Open sources

- Volumetric TSDF Fusion of RGB-D Images in Python (2018)
  - https://github.com/andyzeng/tsdf-fusion-python
  - GPU (CUDA)

- CHISEL: Real Time Large Scale 3D Reconstruction Onboard a Mobile Device using Spatially-Hashed Signed Distance Fields (RSS 2015)
  - https://github.com/personalrobotics/OpenChisel
  - CPU

Volumetric TSDF Fusion of RGB-D Images in Python

CHISEL Result

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Thank you

Q&A