#2520

Source Code

Learning-based Lossless Point Cloud Geometry Coding using Sparse Tensors

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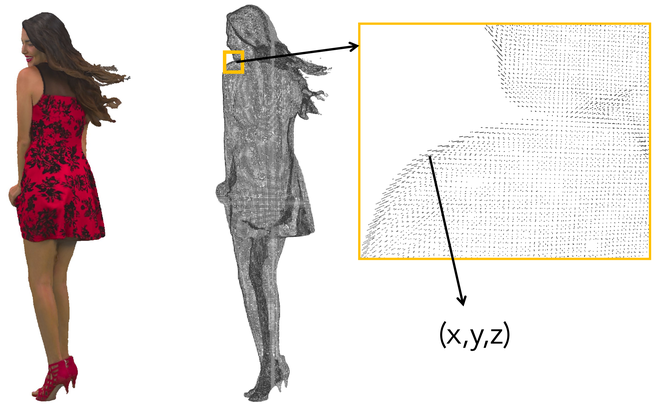
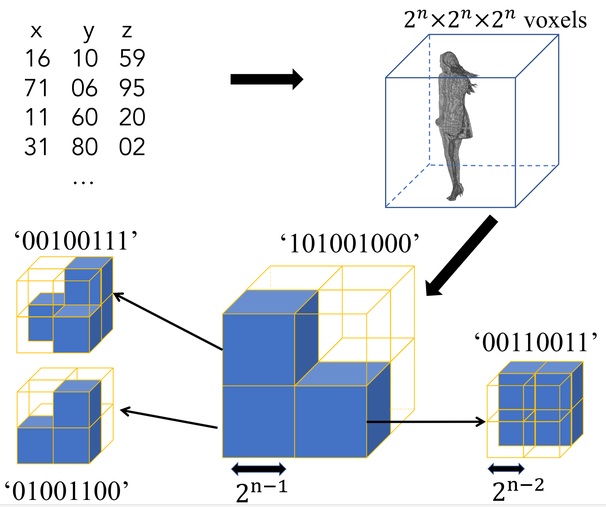
Point Cloud Data



Point cloud with color | Point cloud geometry

- Point clouds are sparse and irregular
- We losslessly encode point cloud geometry

Point Cloud Geometry Representations



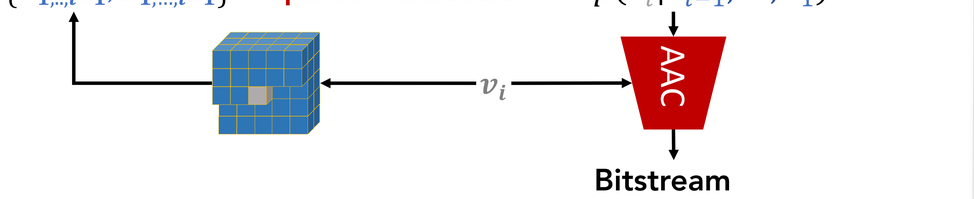
Lossless Compression

- **Arithmetic coder:** Based on p.d.f p of each symbol s
  - Average bit per symbol: $L = \sum_{s \in S} p(s) l(s)$
  - Shannon theorem: $L \geq H(p) = \sum_{s \in S} p(s) \log(s)$
  - Sub-optimal lower bound: $\tilde{L} = \sum_{s \in S} p(s) \log(\hat{p}(s))$
- More likely symbols get fewer bits
- Minimize the bitrate by estimating p

Causal Context Model

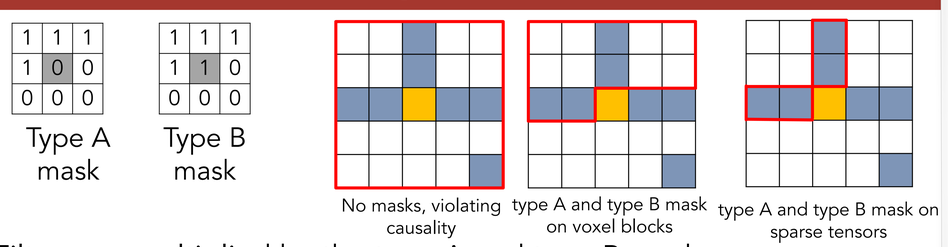
Likelihood of voxel block v → $p(v) = \prod_{i=1}^{d^3} p(v_i | v_{i-1}, v_{i-2}, \dots, v_1)$

Probability of voxel v_i being occupied given all previous voxels



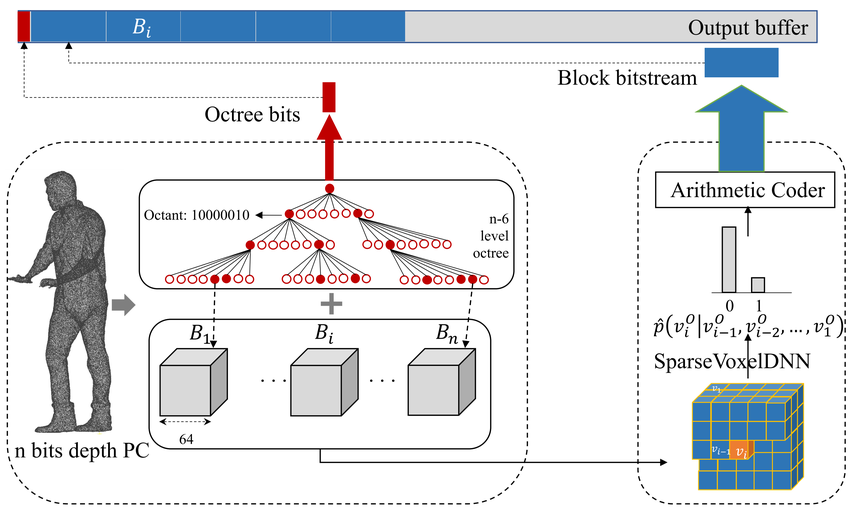
- Everytime a voxel is encoded, it is fed back into **SparseVoxelDNN** to predict the probability of the next voxel

Causality enforcement



- Filters are multiplied by the type A and type B mask
- Type A is applied on the first layer, type B masks are applied on the subsequence layers

System Overview



Test Point Clouds

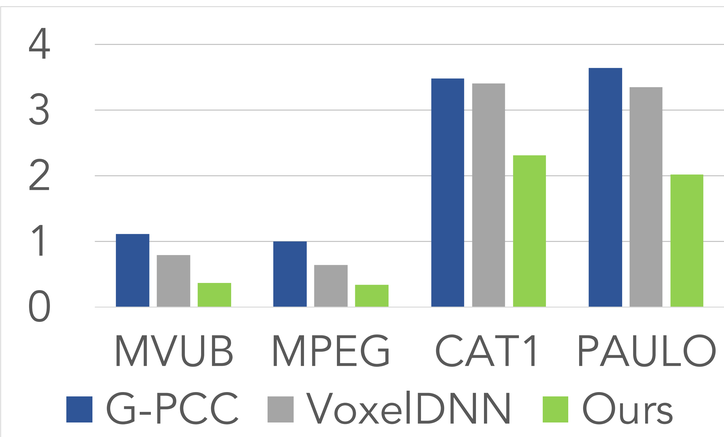
Microsoft Voxelized Upper Bodies (MVUB)

MPEG 8i

MPEG CAT1

PAULO

Results



Bpp of our method vs G-PCC, VoxelDNN

	G-PCC	VoxelDNN	Ours
Enc (s)	1.6	355	7.2
Dec (s)	1.1	350	229