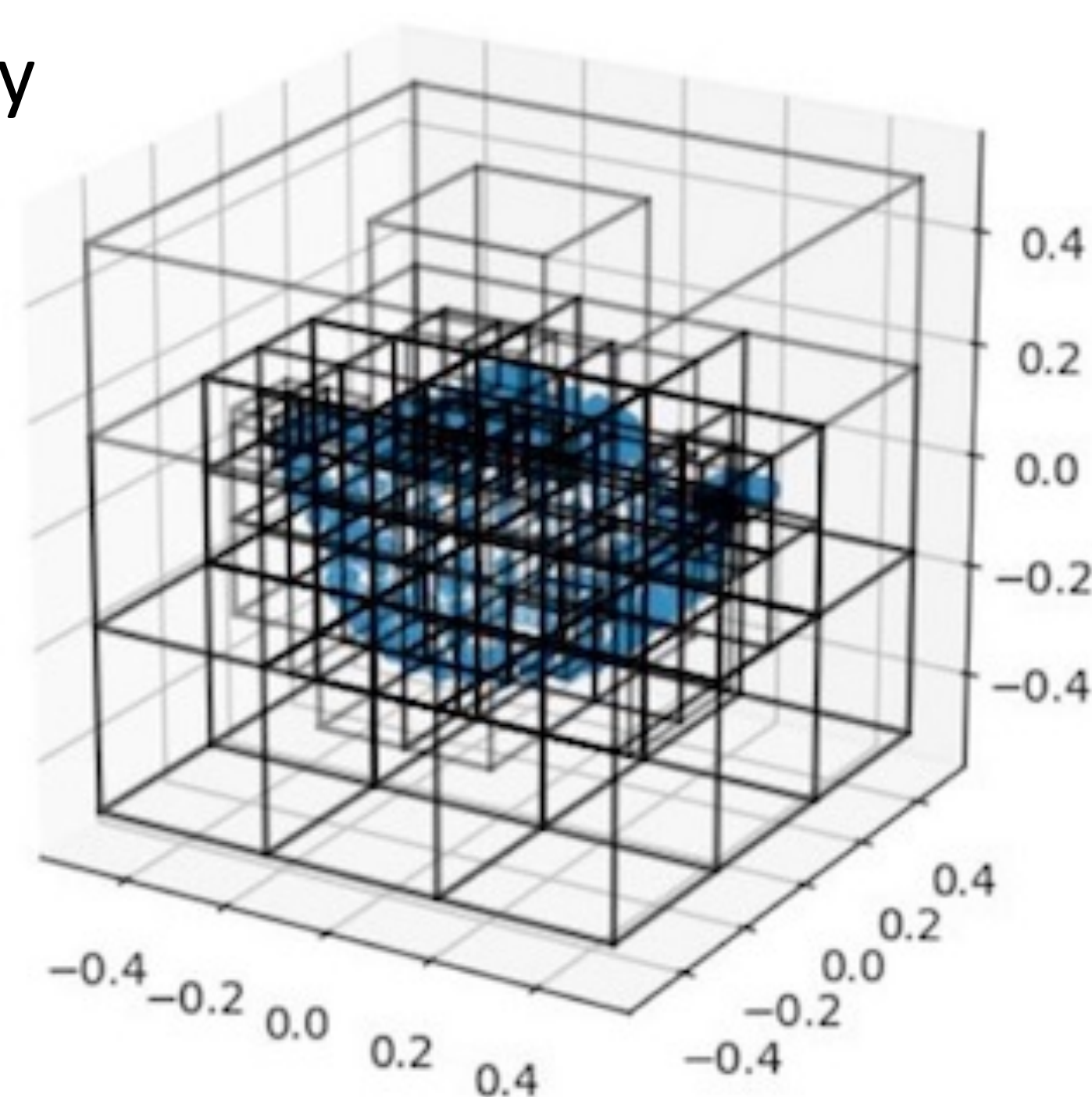


INTRODUCTION

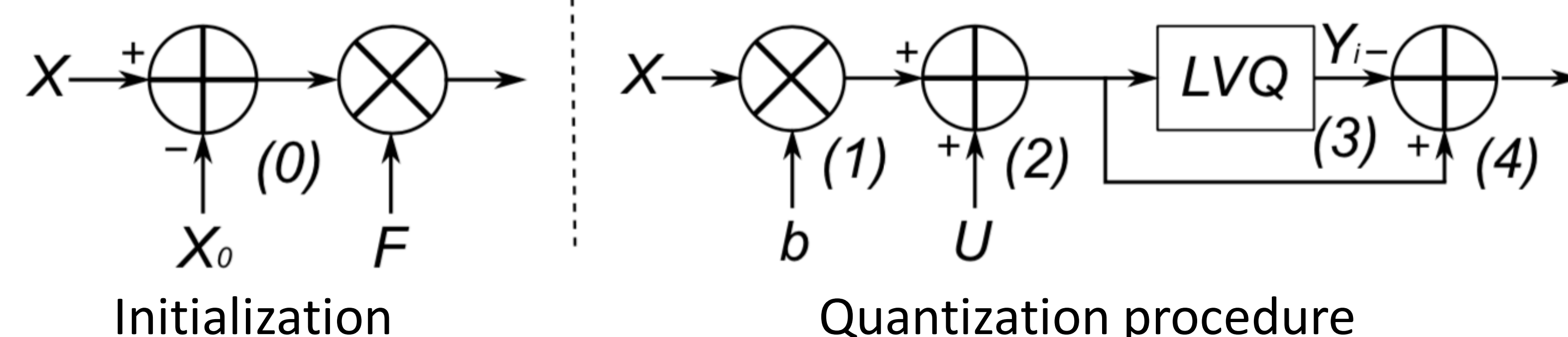
- Lossy compression of the PC geometry
- Hierarchical representation based on adaptive TSPLVQ
- 2 partition schemes : (2x2x2) vs. (3x3x3) to project recursively the PC into a series of embedded truncated cubic lattices
- 2 geometric distortion metrics
- Rate vs. geometry distortion optimization



PROPOSED ADAPTIVE TSPLVQ

Basic quantization procedure in 5 steps:

- (0): normalization of the input X to fit inside the root Voronoï cell
 - centering around the mean point X_0
 - scaling by the factor F
- (1) and (2): for a point X inside a given cubic Voronoï cell, scaling by factor b and shifting by U
 - for a (2x2x2) partition : $b=2$ and $U=(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$
 - for a (3x3x3) partition : $b=3$ and $U=(0, 0, 0)$
- (3): fast quantization algorithm to produce by rounding the corresponding reproduction vector Y_i
- (4): centering of the output vector to permit the next quantization level



For each loop of the coding process, choice of the cube to partition and of its partitioning scheme (2x2x2) or (3x3x3)

Lagrangian optimization taking into account of :

- the increase in rate (tree encoding entropic cost)
- the decrease in geometric distortion

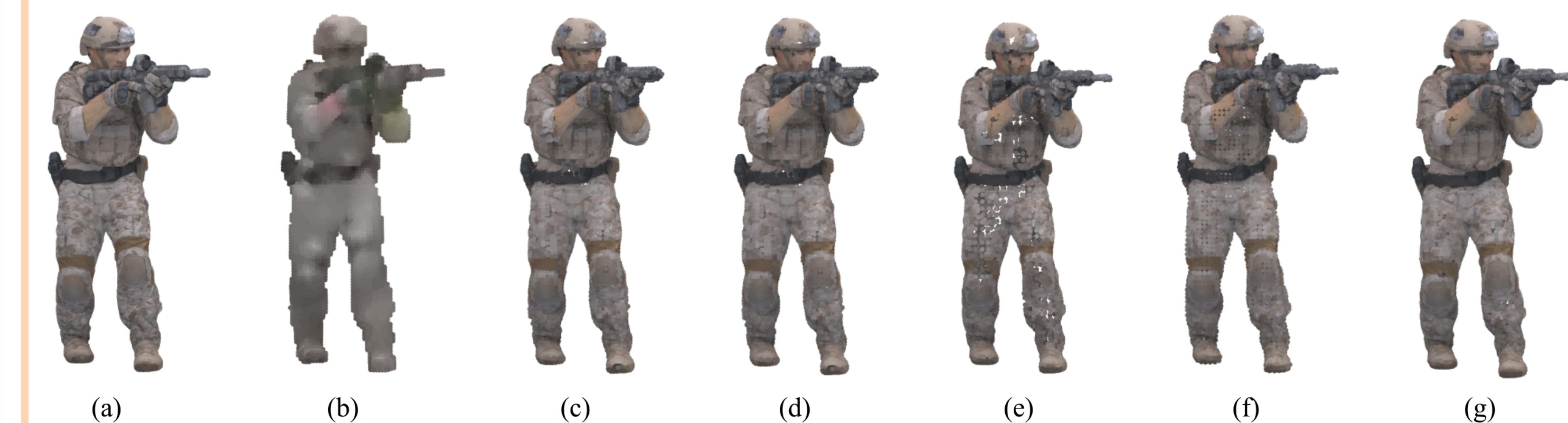
- Point-to-Point metric
$$D_{P2Point} = \sum_{X \in C_i} d(X, Y_i)$$

- Point-to-Plane metric
$$D_{P2Plane} = \sum_{X \in C_i} || \vec{V}_d(X, Y_i) \cdot \vec{N}_X ||$$

Stop of the coding process when the bit budget is reached

To each occupied leaf corresponds an output point:

the average value of the PC points within the leaf cell



Rendering of uncompressed PCs:

- (a): original PC with 1 089 091 points
- (b): MPEG lossy PCC, with $\approx 20\ 000$ points
- (c), (d), (e), (f): our approach, with $\approx 20\ 000$ points
 - (c) only (2x2x2) partitions
 - (d) only (3x3x3) partitions
 - (e) hybrid partitioning with Point-to-Plane distortion
 - (f) hybrid partitioning with Point-to-Point distortion
 - (g) hybrid partitioning as (e) but with $\approx 30\ 000$ points

EXPERIMENTAL RESULTS

Dataset: *Soldier*, *LongDress* and *Loot* from people object, MPEG-3DG group

PC Images	MPEG G-PCC	Our approach		
		3x3x3	2x2x2	Hybrid
<i>Soldier</i>	16.48	18.72 19.02	11.2816 14.32	18.70 14.45
<i>LongDress</i>	16.53	18.74 19.89	9.28 61.08	15.89 17.74
<i>Loot</i>	16.54	15.33 17.65	18.77 10.49	15.36 19.13

Comparison of symmetric MSE between our proposed method based either on point-to-point or point-to-plane distortion (in **bold**), and MPEG reference model

CONCLUSION

- Lossy compression of the geometric data of 3D PC based on TSPLVQ.
- Adaptive and multi-scale TSPLVQ
- Optimal partitions iteratively chosen according to rate-distortion optimization criterion
- Promising performances of the hybrid partitioning scheme with Point-to-Plane distortion
- Conclusive subjective quality of the rendered content