

G-PCC:
A simplified octree node structure

m53677 — D. Flynn, K. Mammou

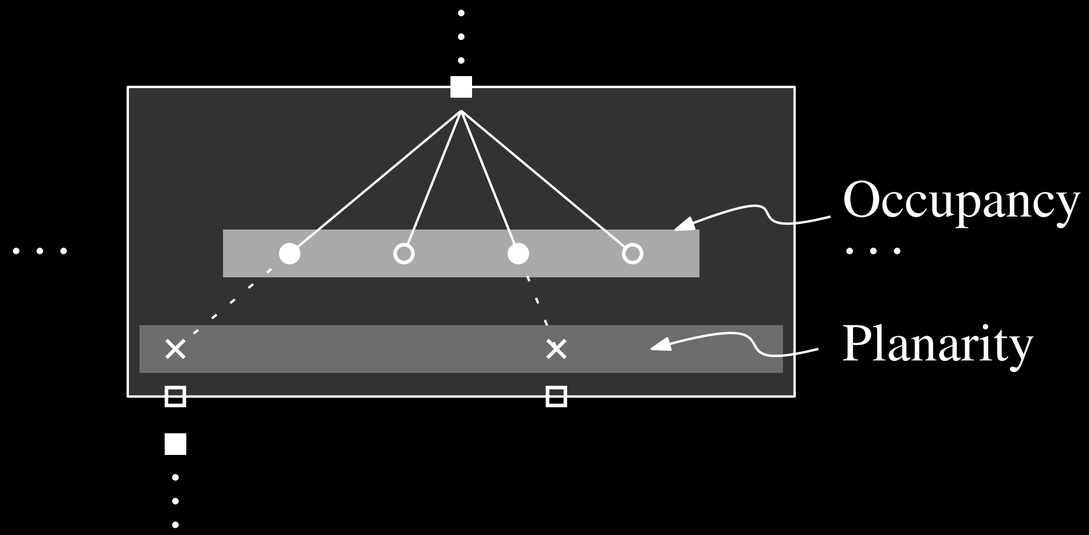
“This is a mess”

What’s in a geometry tree node?

- A QP (signalled at signalling depth, or inherited)
- Occupancy → indicates presence of up to 8 children
- Planar information about each child
- Duplicate point count for leaf points
- IDCM flag and residual (for nodes with single child, when eligible)

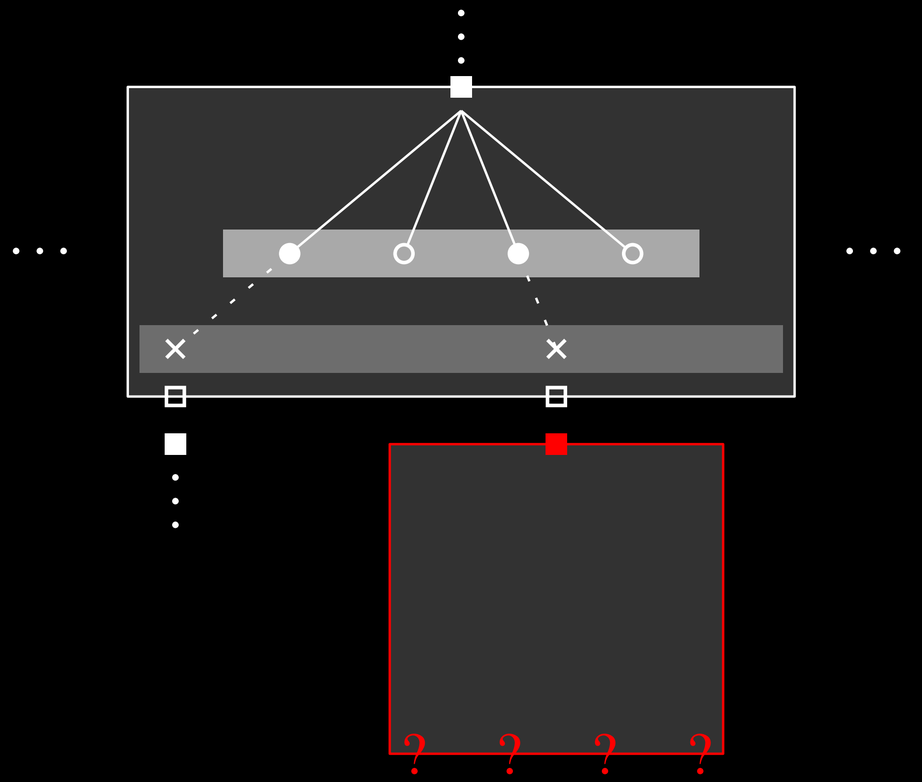
Octree overview

A node



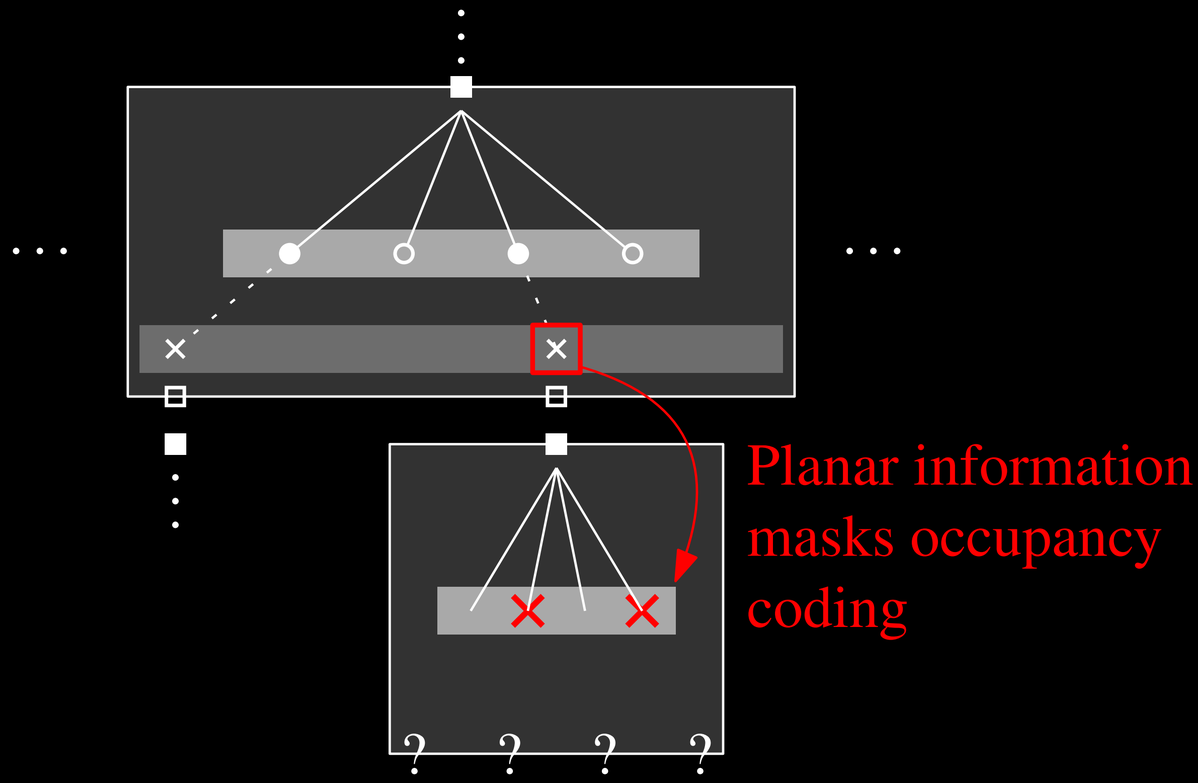
Octree overview

Coding a node



Octree overview

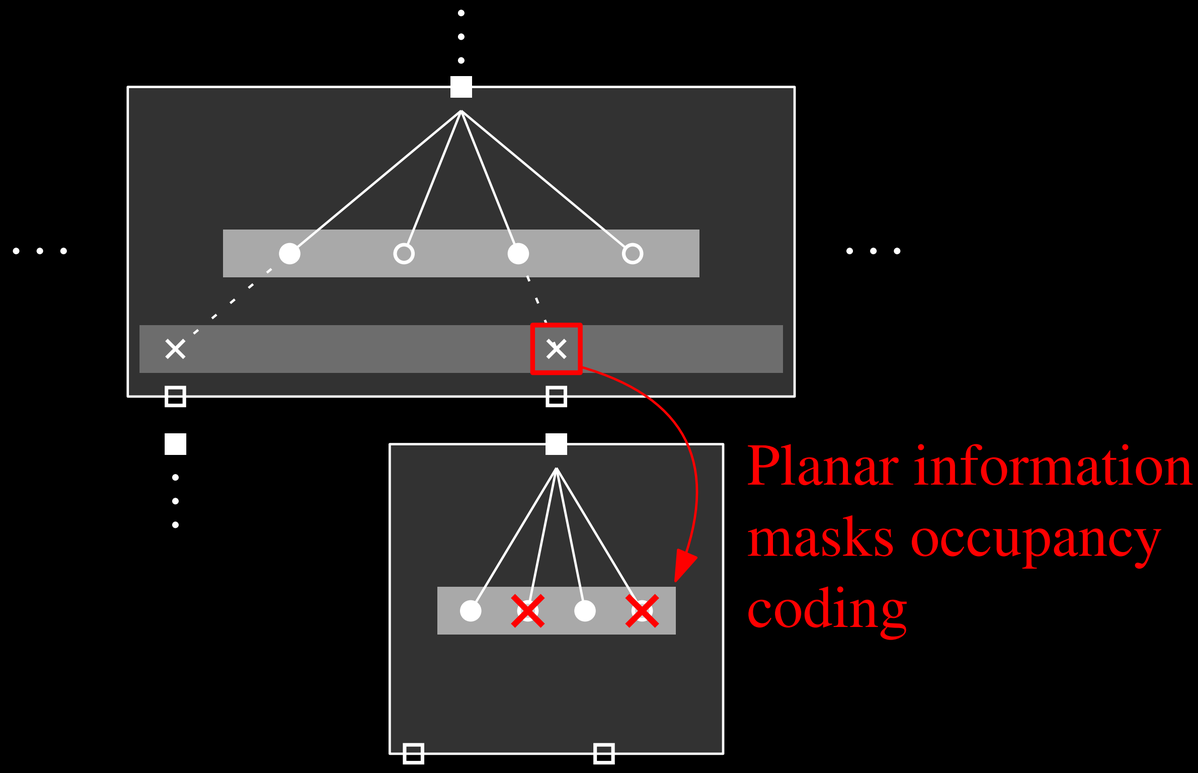
Occupancy



Planar information masks occupancy coding

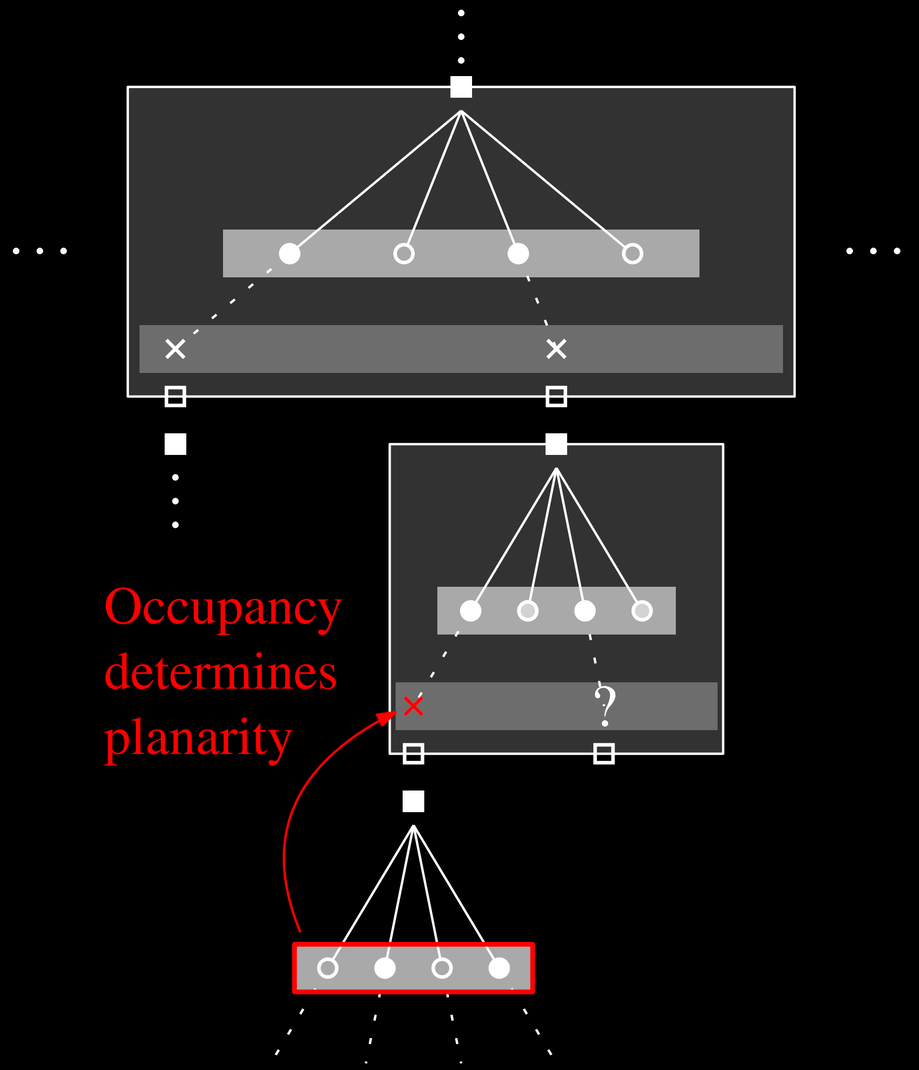
Octree overview

Occupancy



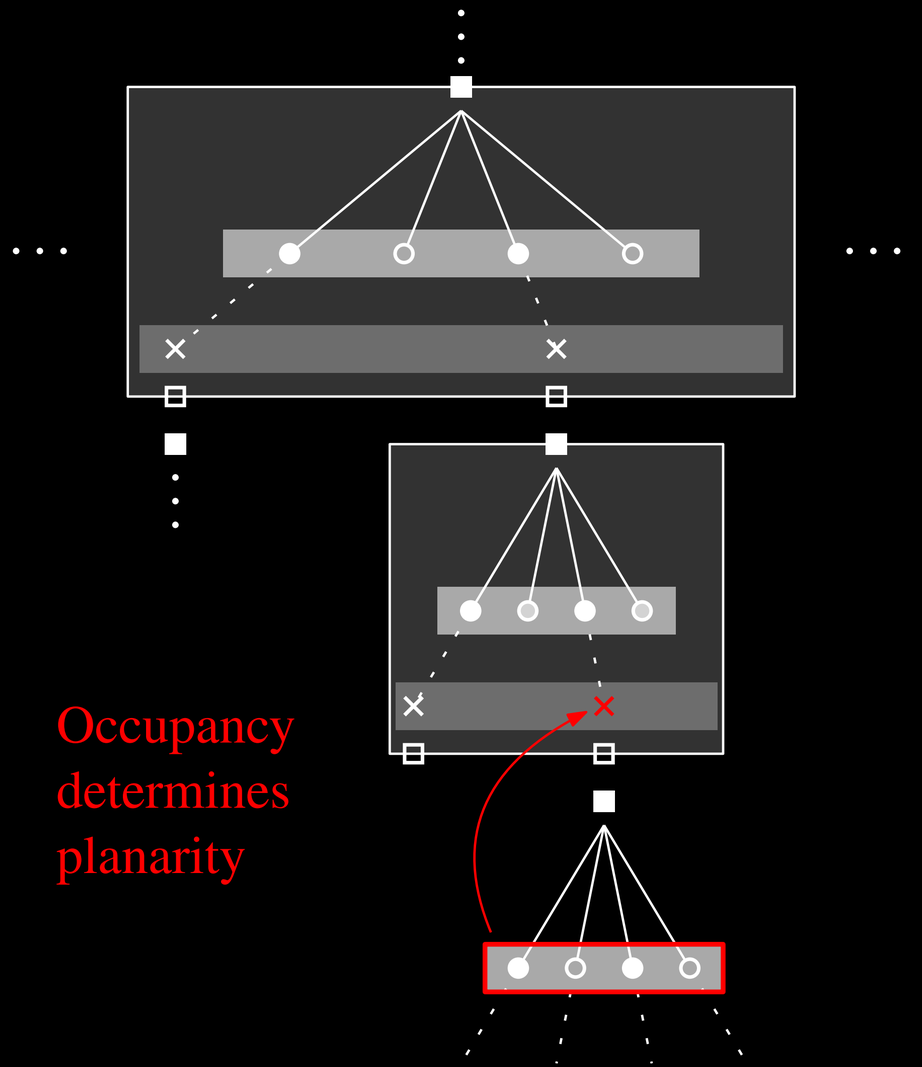
Octree overview

Planar



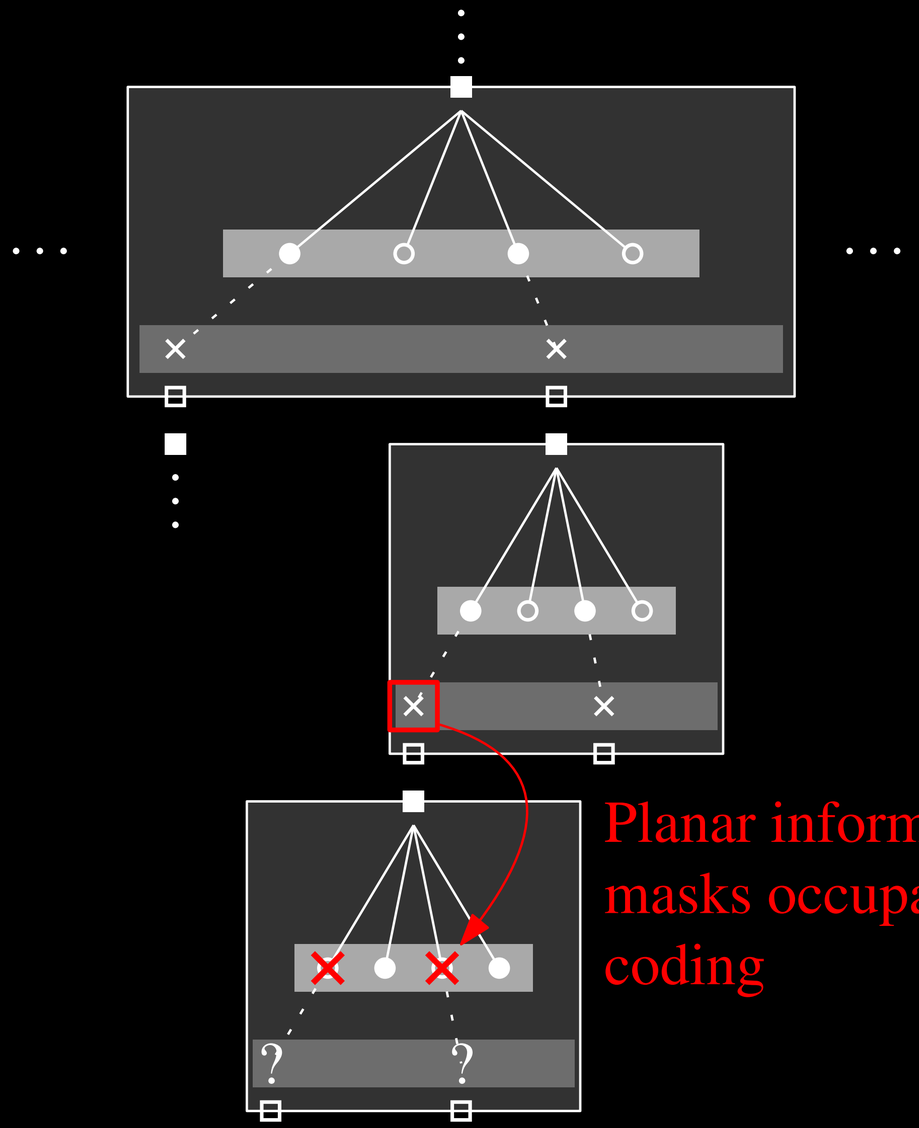
Octree overview

Planar



Octree overview

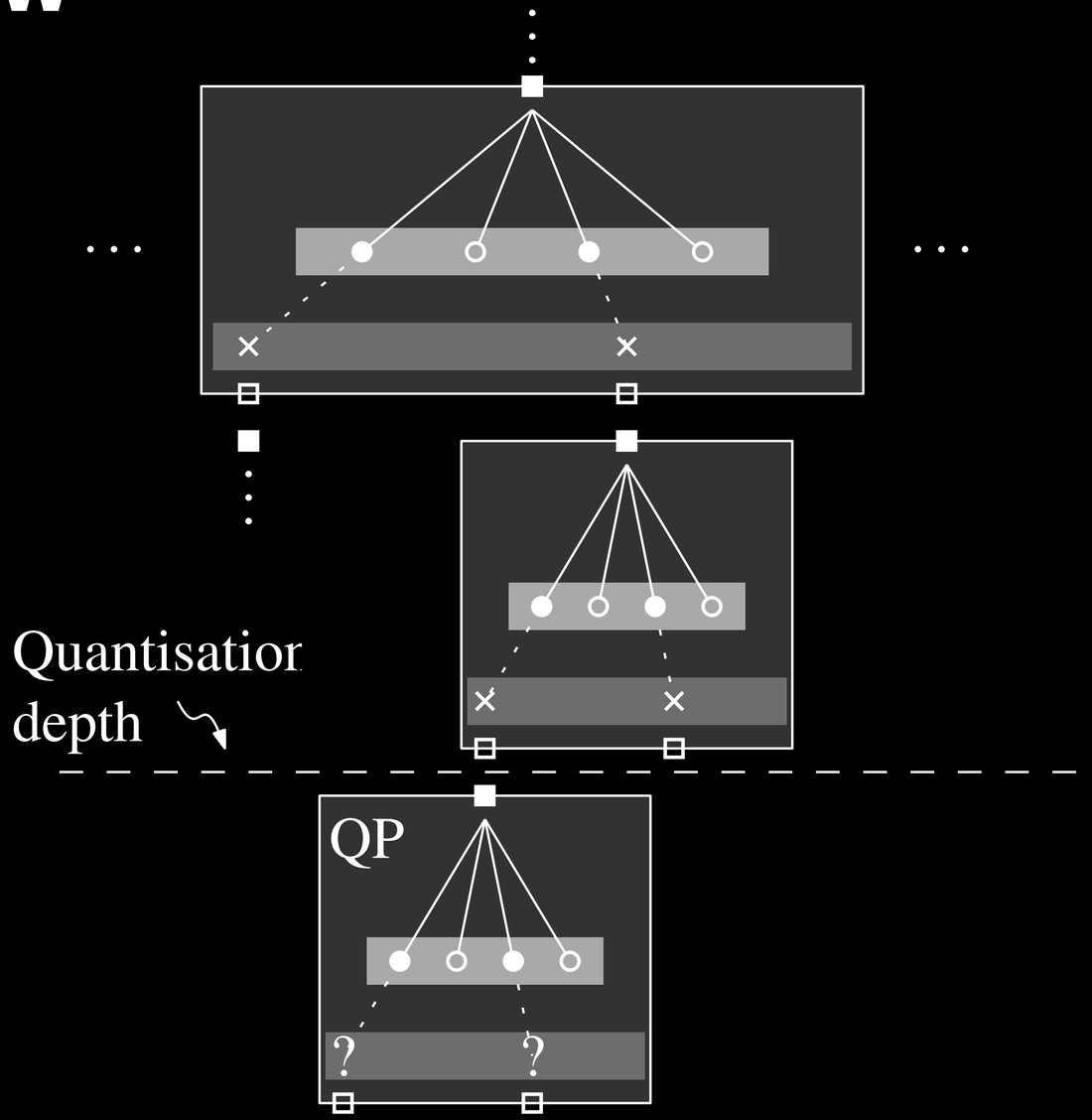
Occupancy



Planar information masks occupancy coding

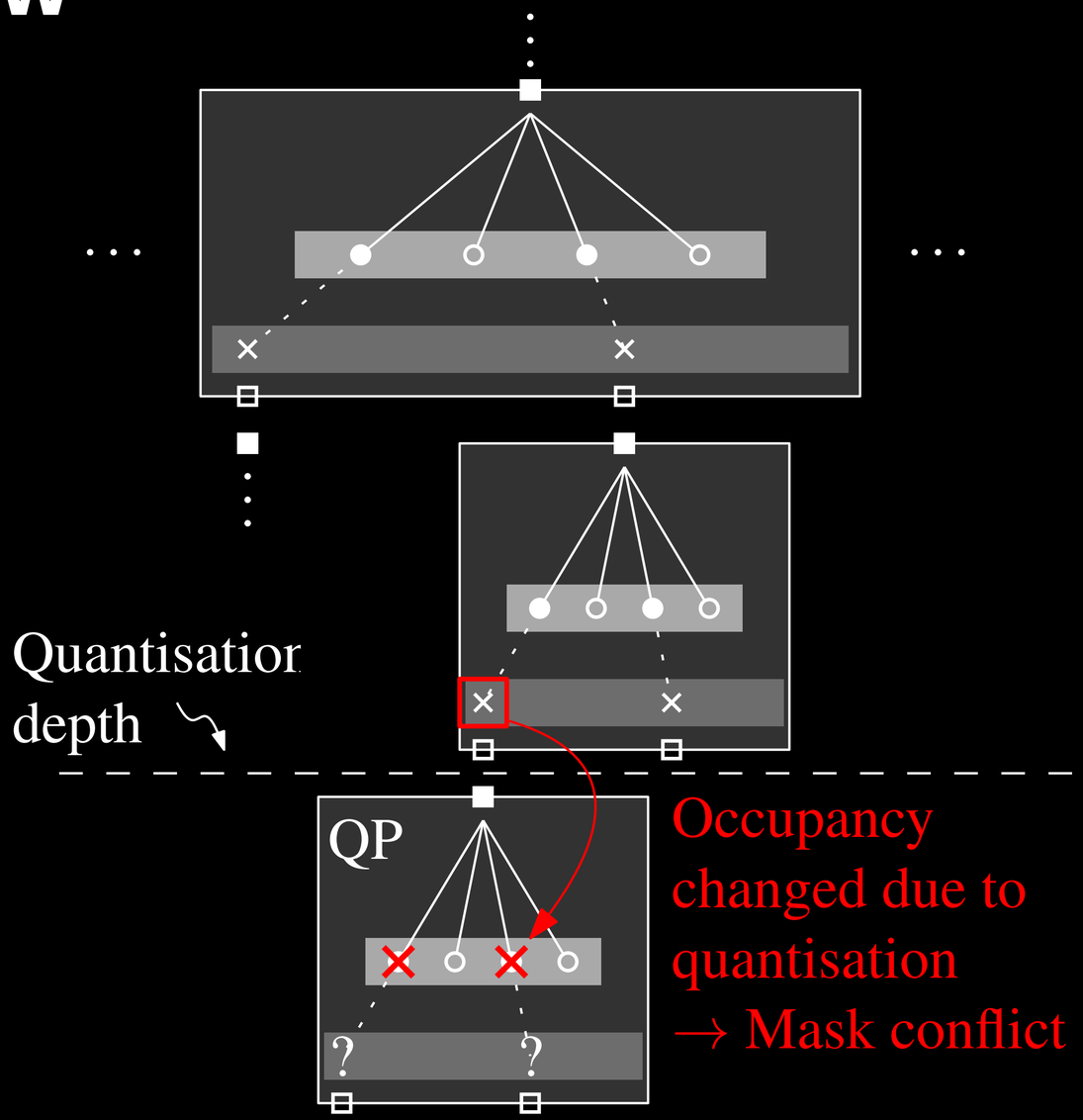
Octree overview

Quantisation



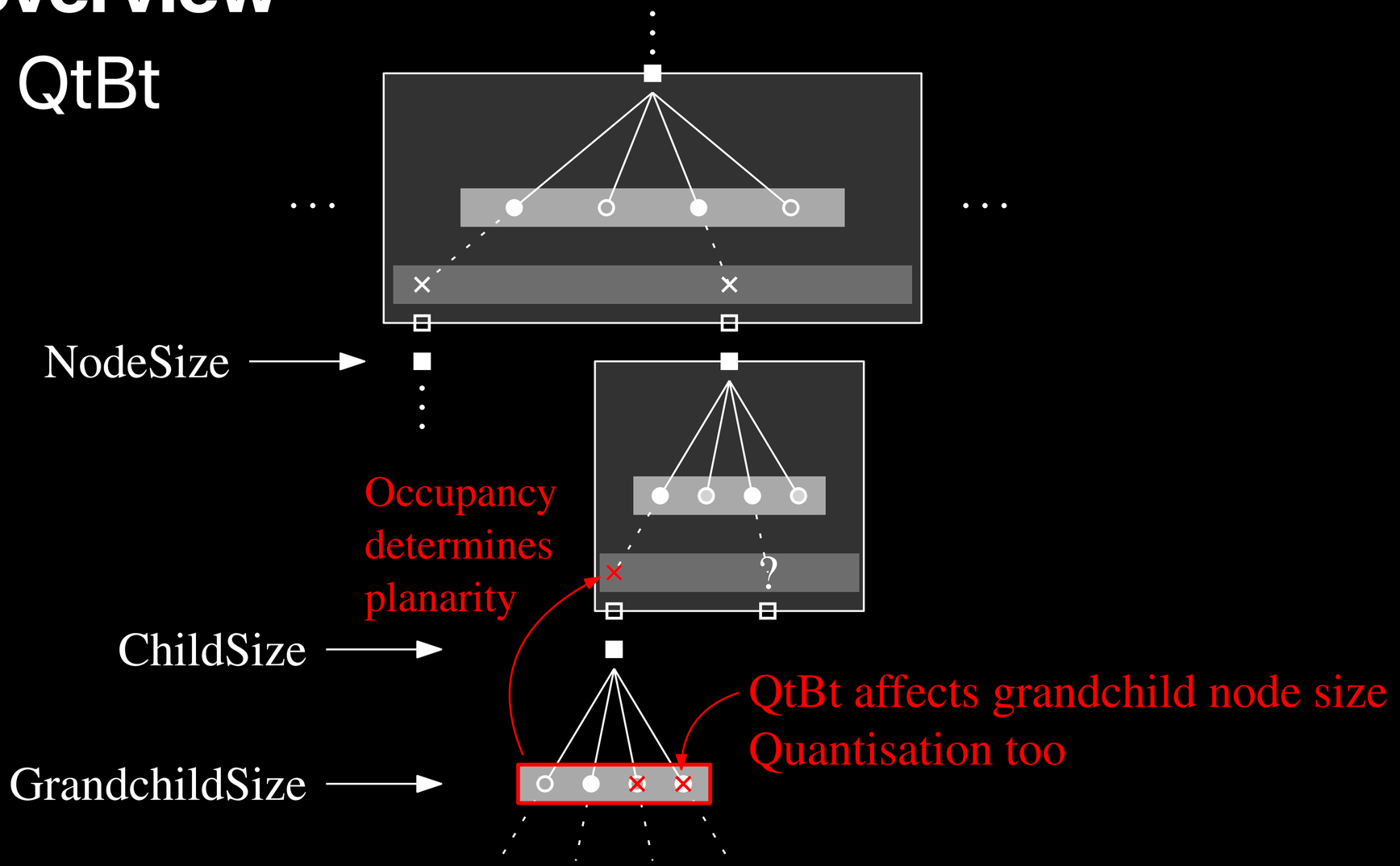
Octree overview

Planar vs QP



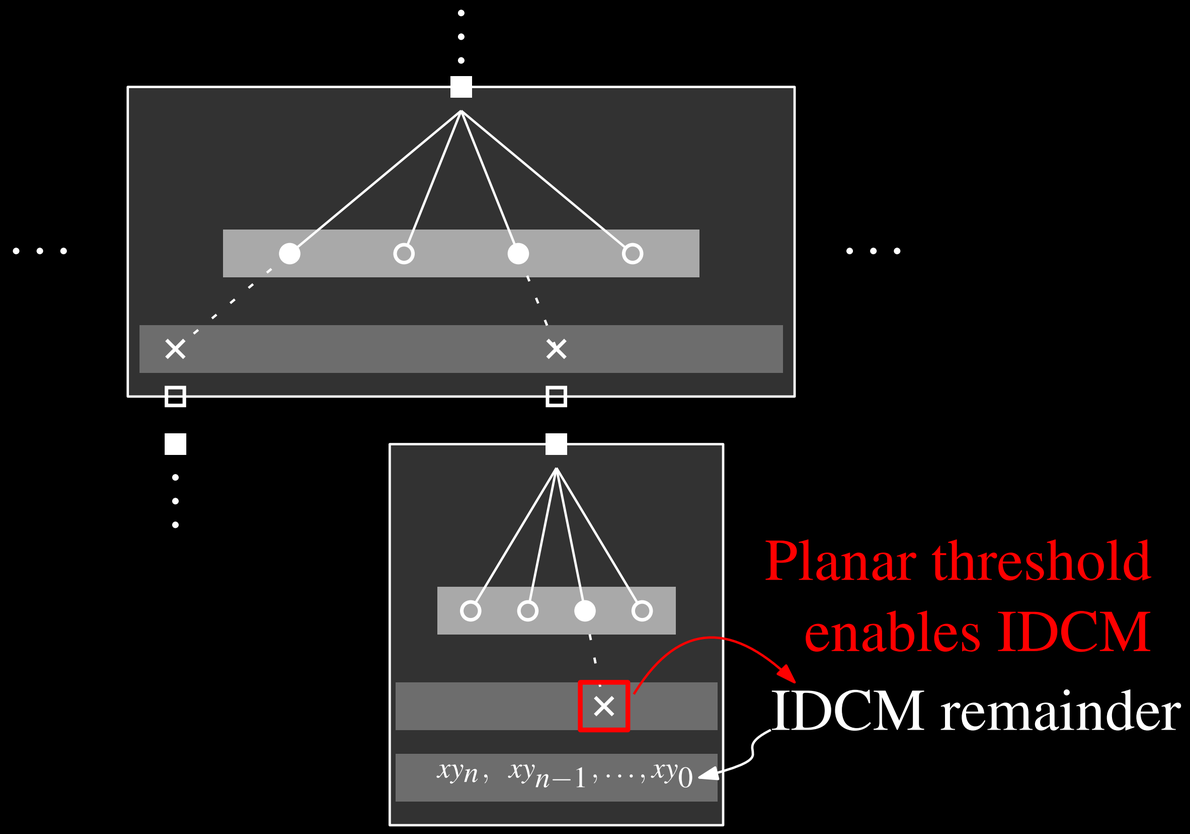
Octree overview

Planar vs QtBt



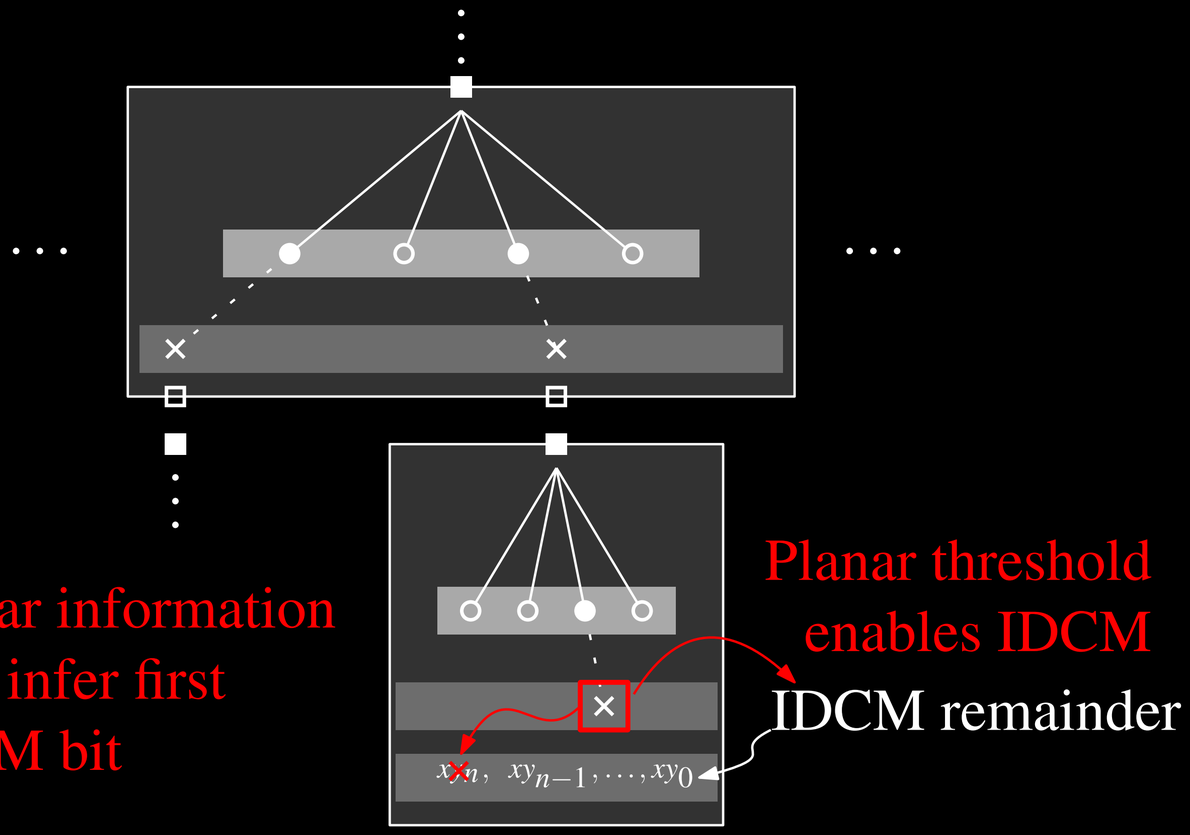
Octree overview

IDCM



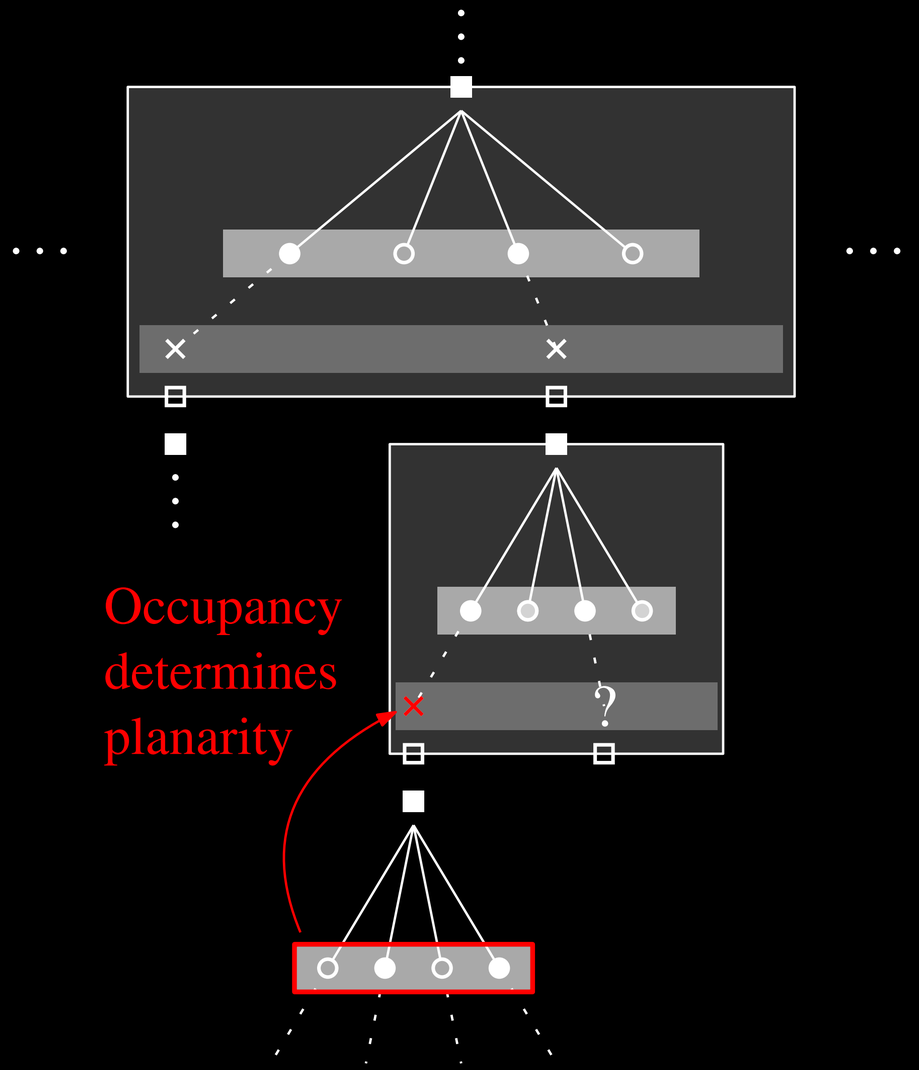
Octree overview

IDCM



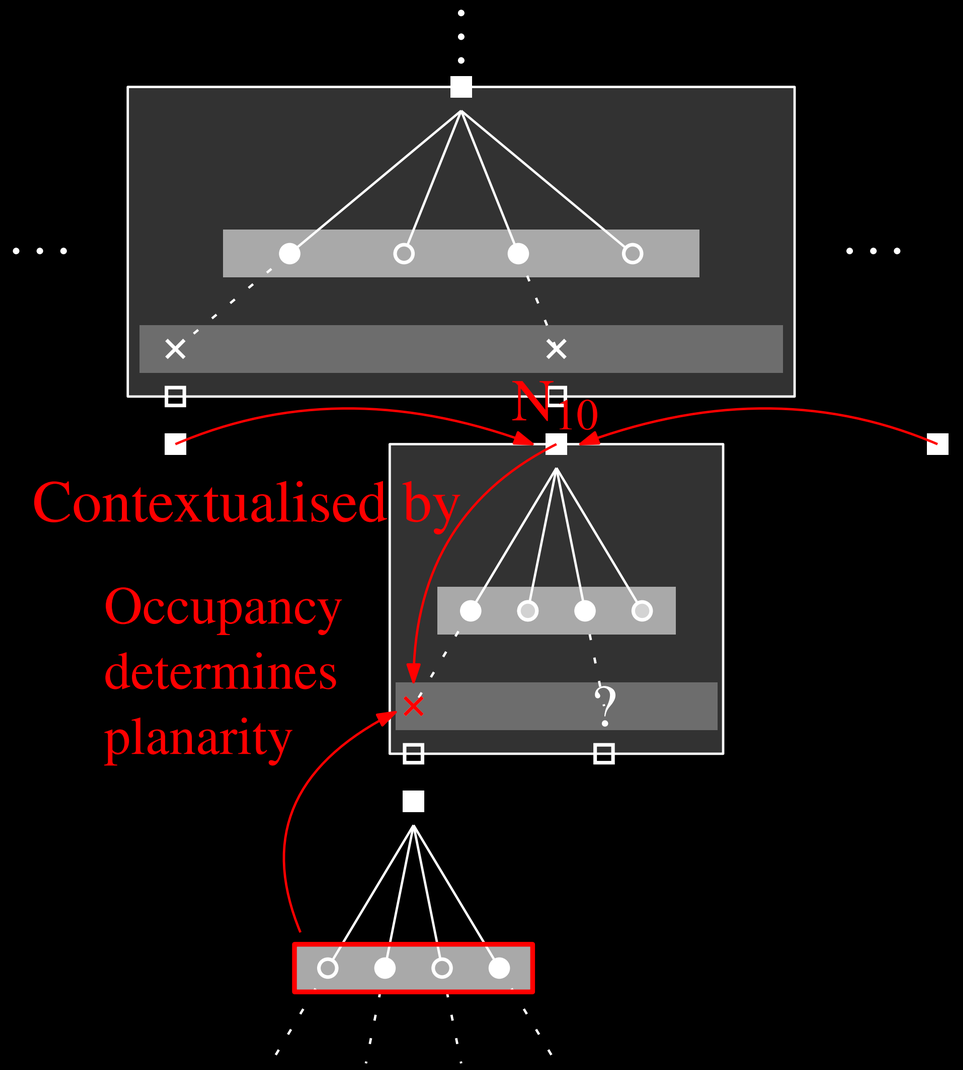
Octree overview

Planar



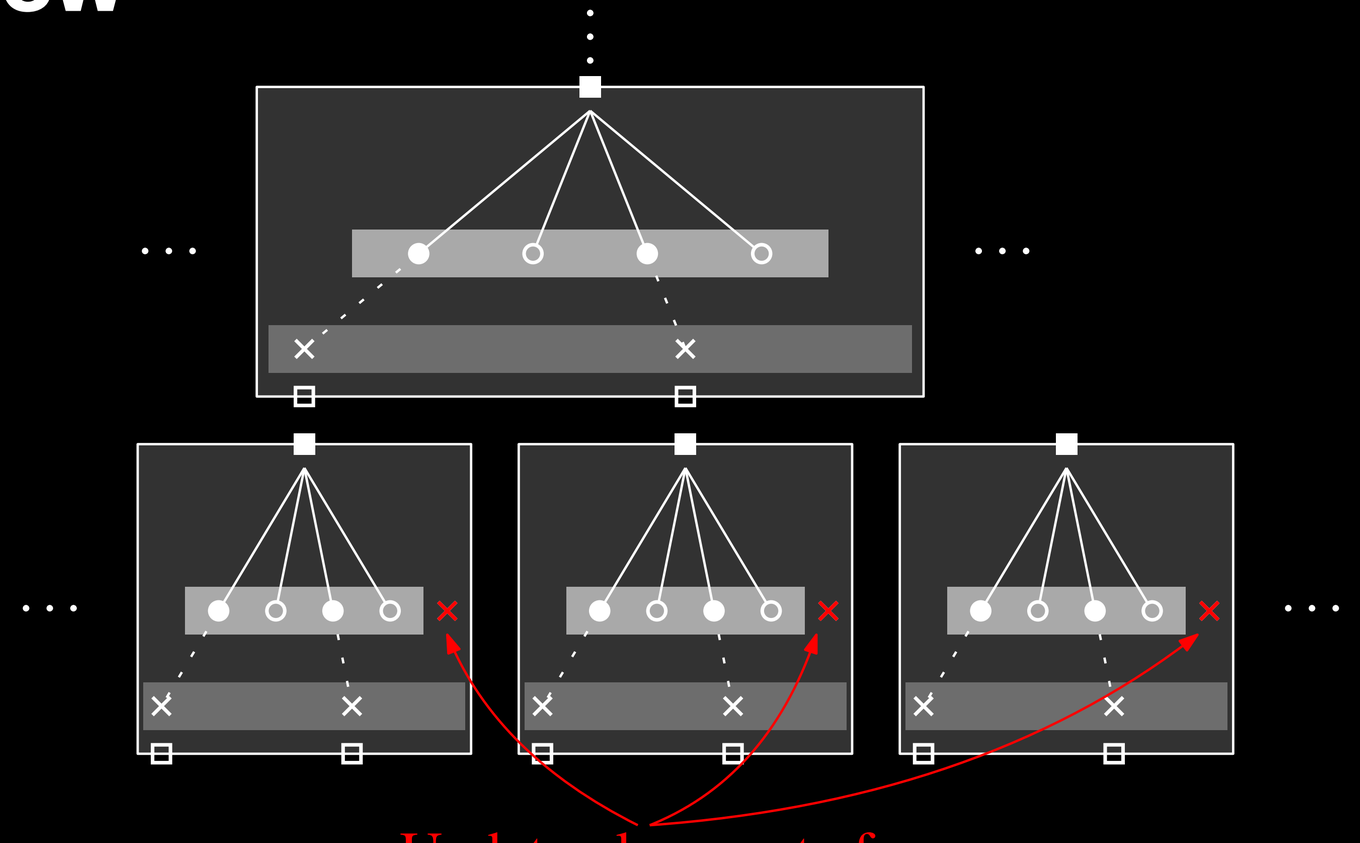
Octree overview

Planar



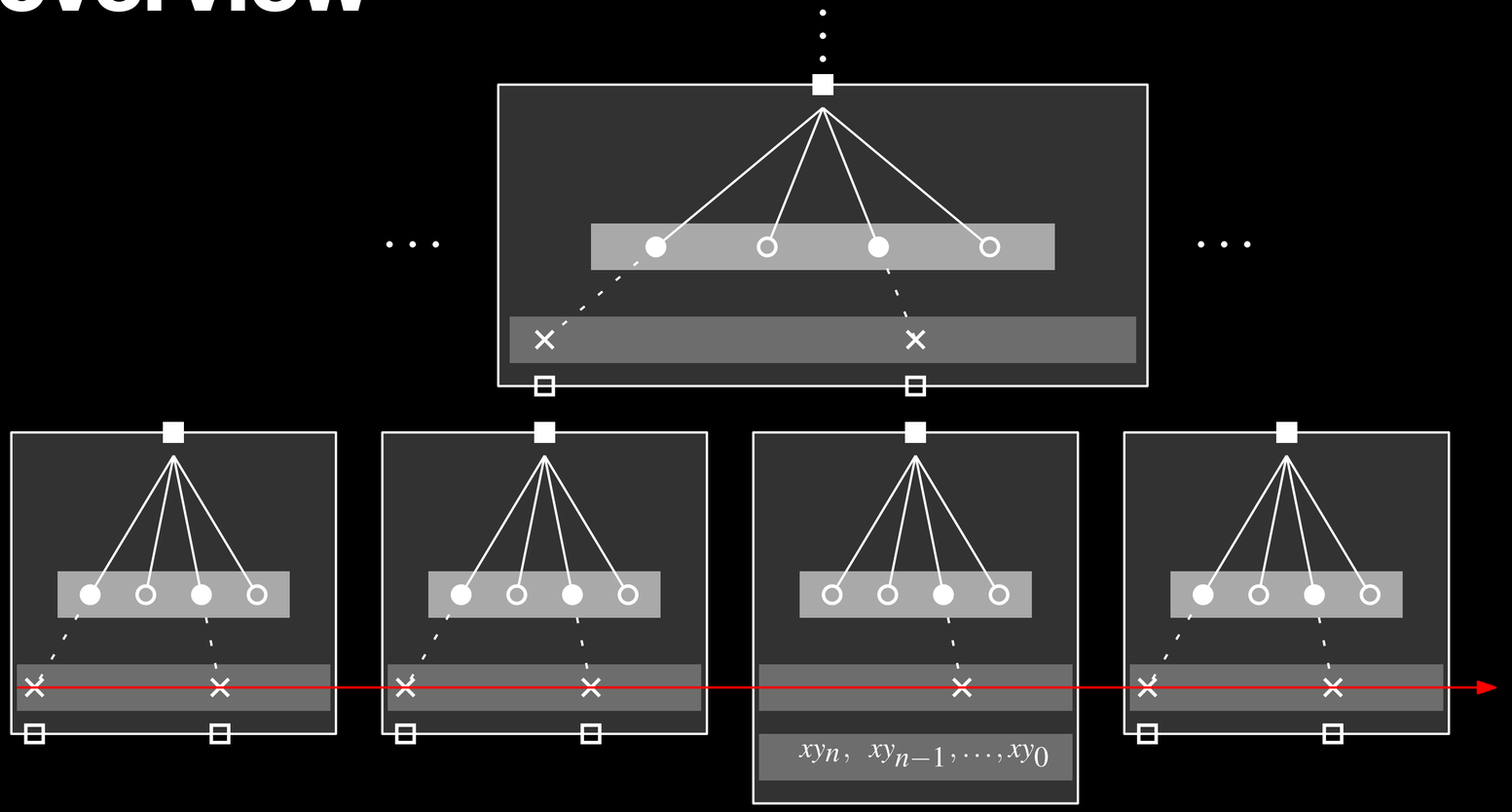
Octree overview

Planar



Octree overview

Planar



IDCM can benefit from Planar

Planar is the odd one out

- Planar inspects grandchildren
- Everything else works one level higher

Interactions

- QtBt: planar eligibility depends on child QtBt state
- Quantisation: affects QtBt state
- Quantisation: planar breaks if quantisation changes occupancy after planarity is determined

Proposed structure

Order of node elements

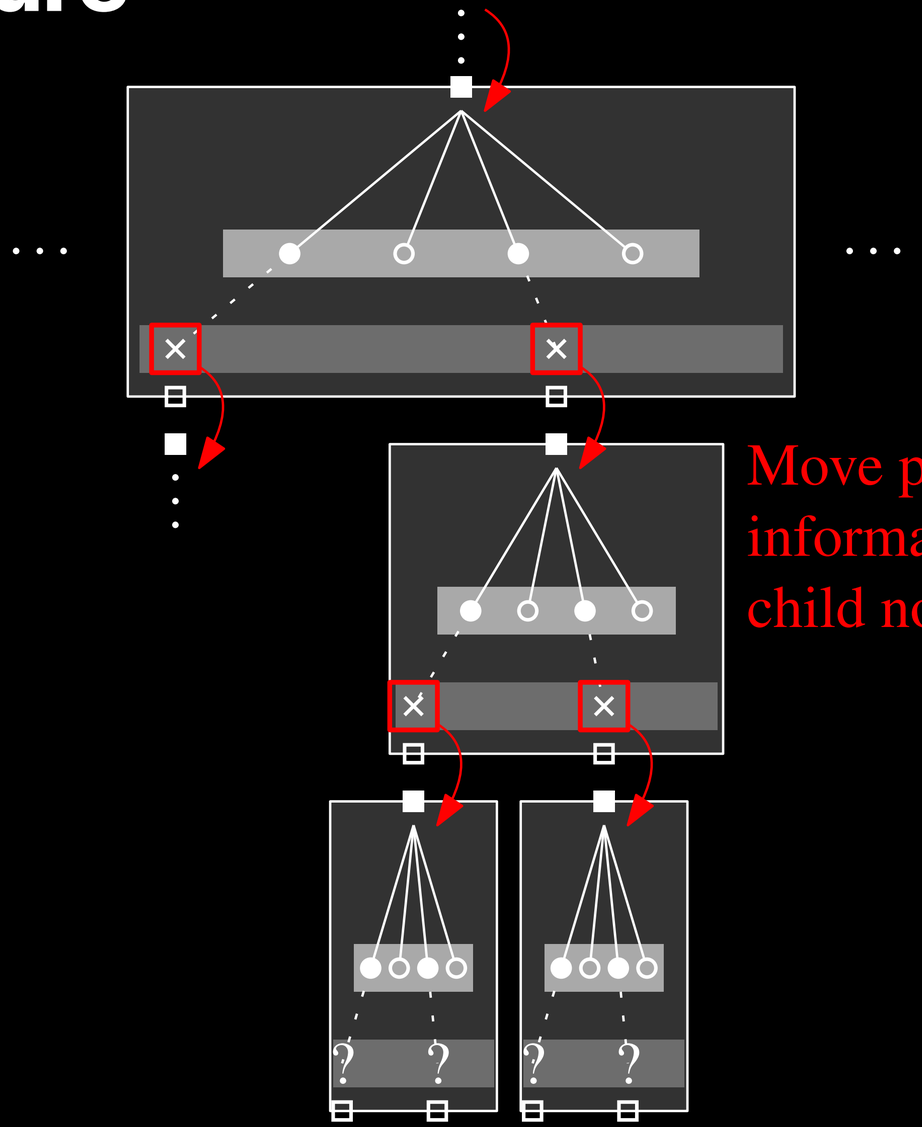
- QP (at signalling depth)
- IDCM flag + residual (for qualifying nodes)
- Planar information for this node
- Occupancy
- Duplicate point count (for each child leaf node)



- QP
- Occupancy
- Dup point count per child leaf
- Planar information per child
- IDCM flag + residual (qualif.)

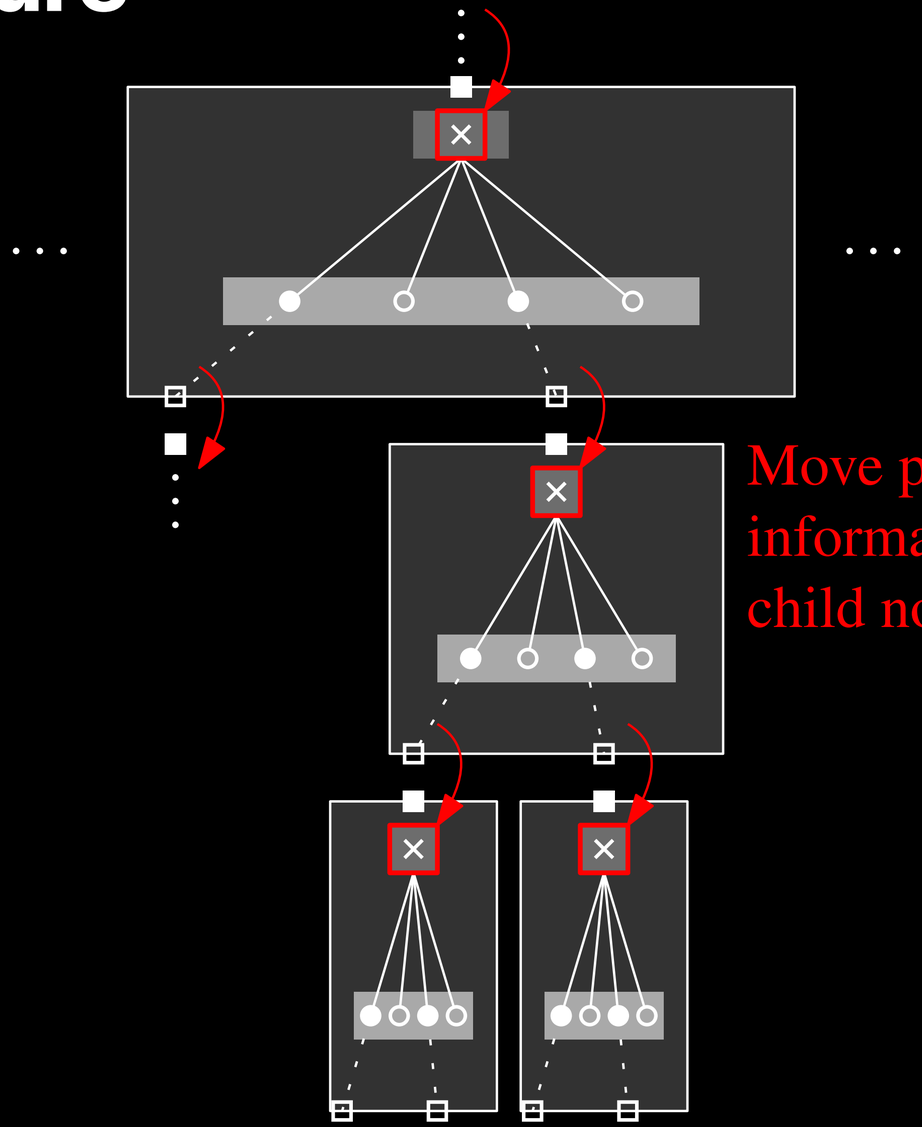
Proposed structure

Avoid state split



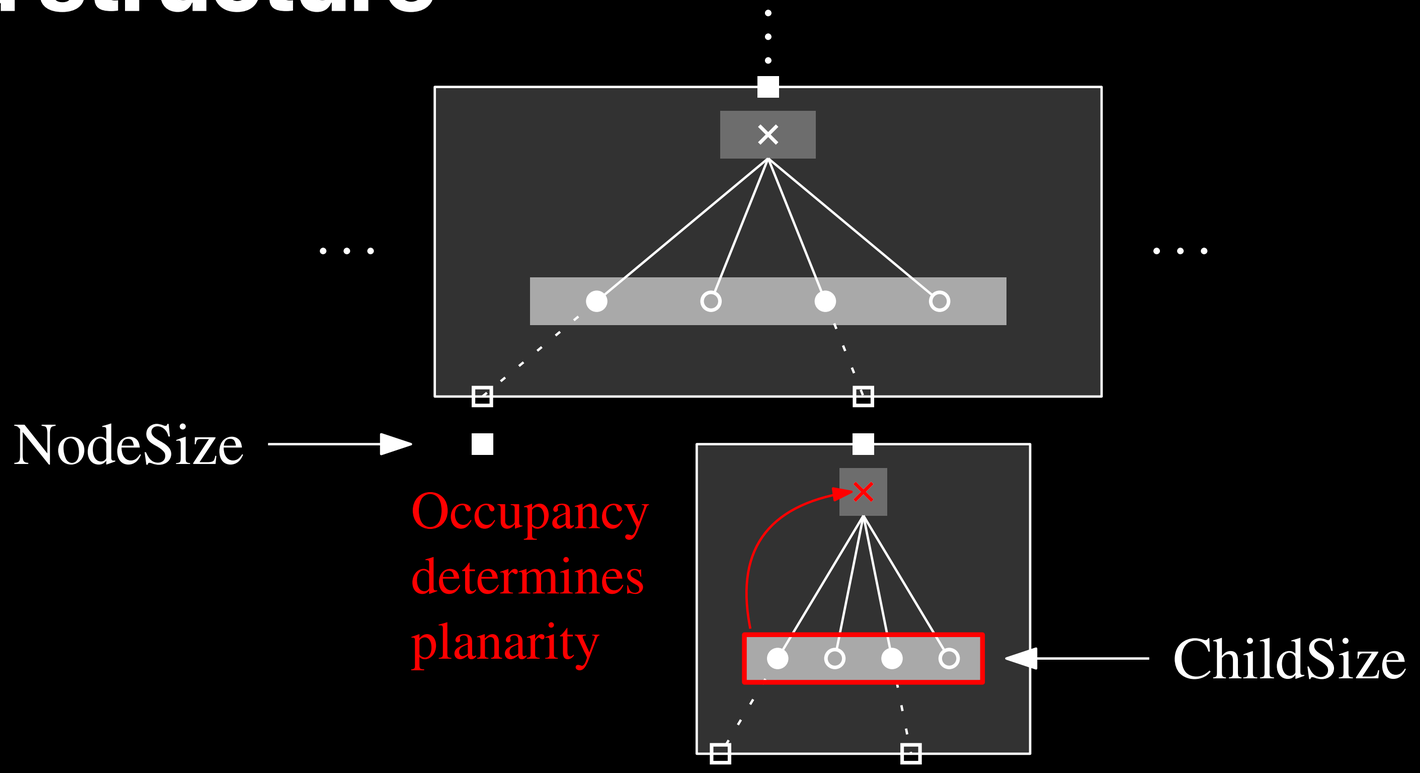
Proposed structure

Avoid state split



Proposed structure

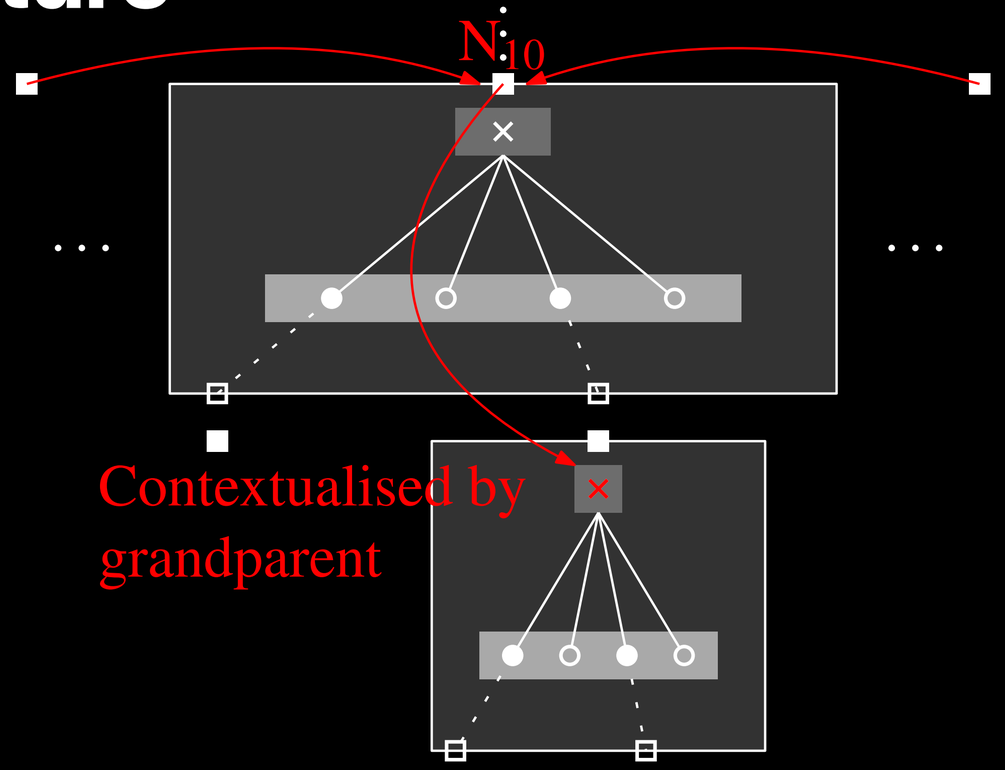
Planar



No need to track grandchildren

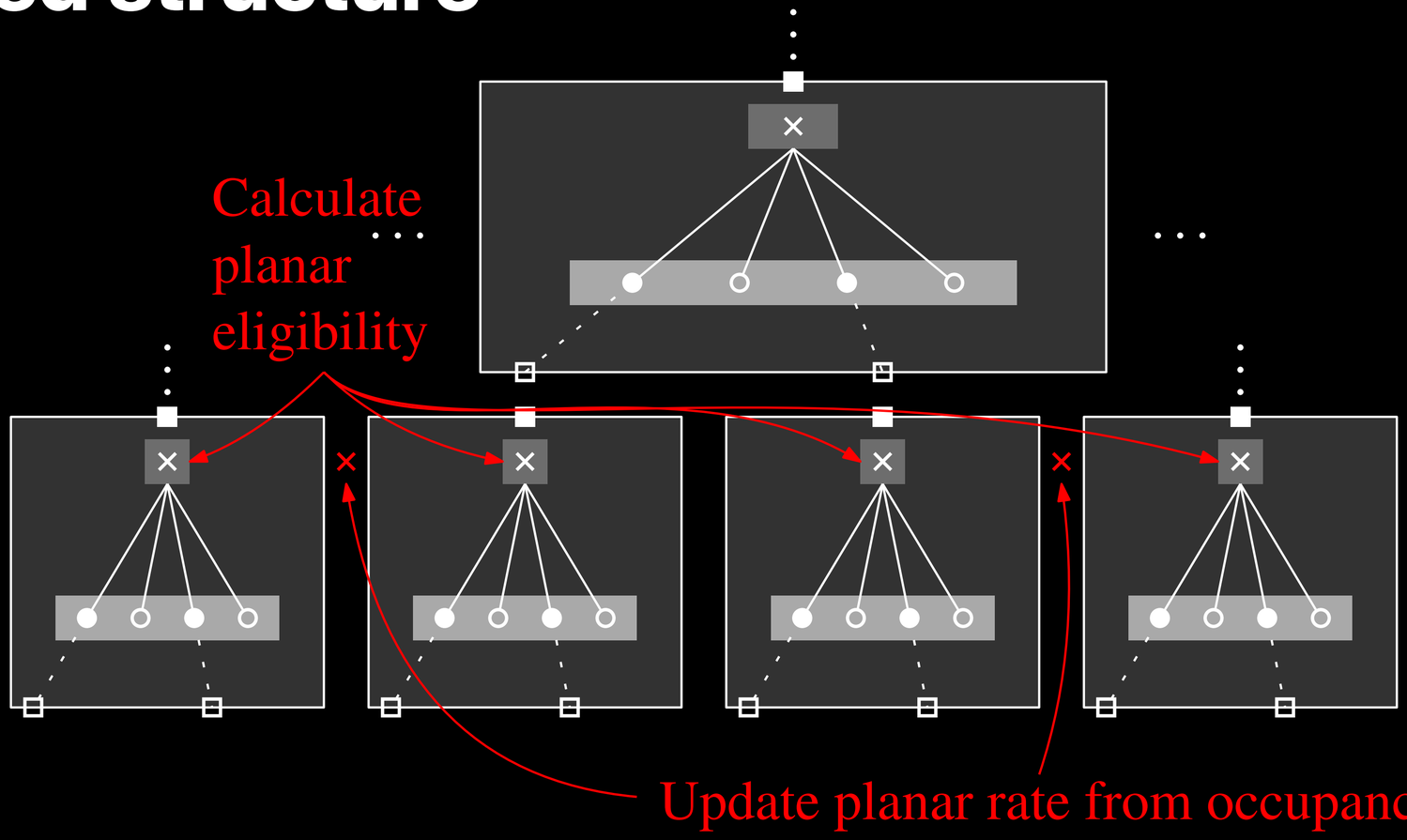
Proposed structure

Planar



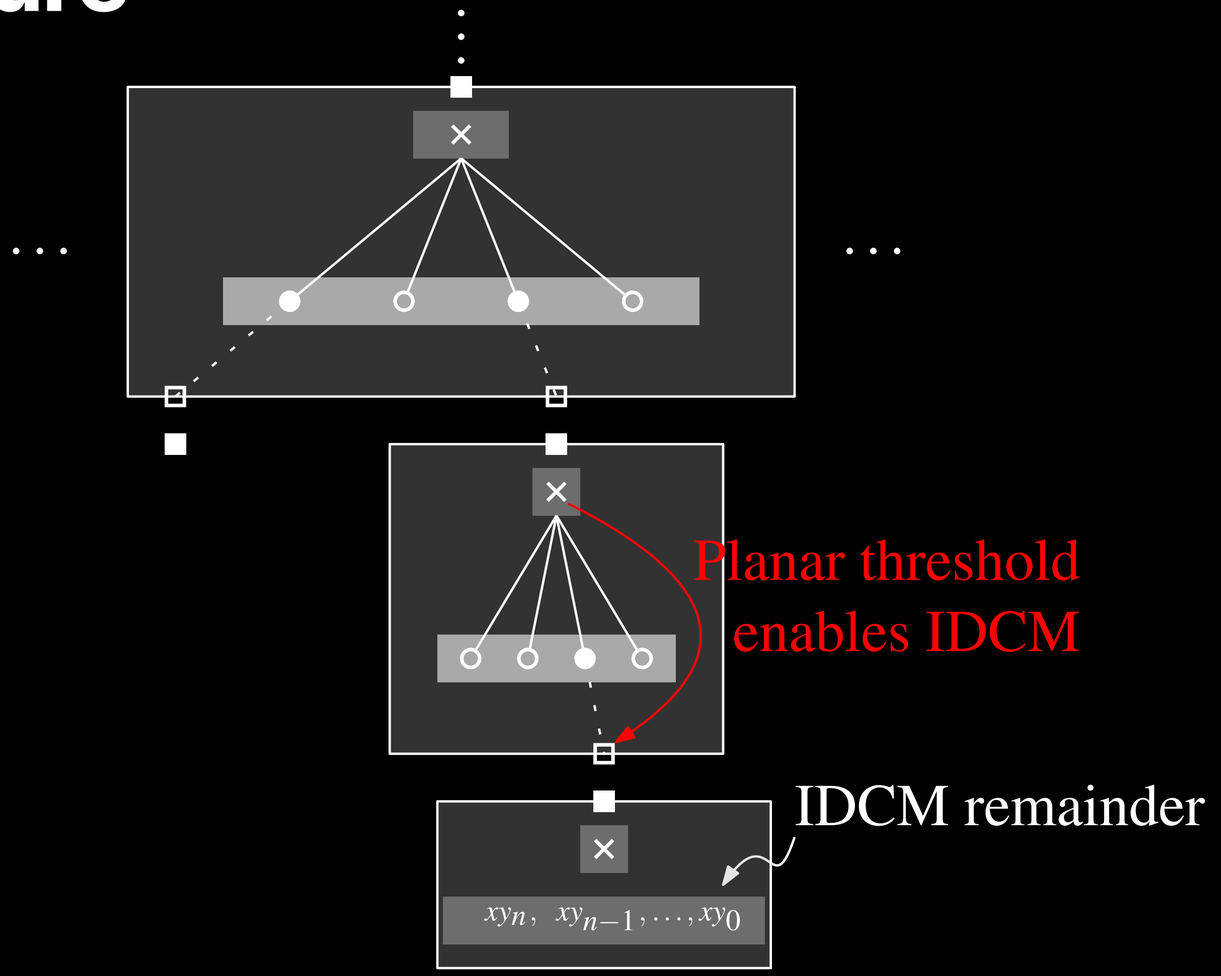
Proposed structure

Planar



Proposed structure

IDCM



Proposed structure

Benefit

- Eliminates an interaction with QtBt
- Eliminates an interaction with in-tree Quantisation
- Eliminates need to inspect points in child nodes
- Conceptually simpler (all operations on current node)

Results

w/o angular

		BPP Ratio [%]			BD-Rate [Δ%]						maxrssk [%]		runtime [%]	
Condition	Class	Geometry	Colour	Reflectance	D1	D2	Y	Cb	Cr	R	Enc	Dec	Enc	Dec
C1_ai	cat1-A				0.0!	0.0!	0.0!	-0.1!	0.0!		100	100	100	102
C1_ai	cat3-fused				0.0	0.0	0.0	0.0	0.0	0.0	100	101	103	111
C1_ai	cat3-frame				-0.0	-0.0				0.0	101	101	99	100
C1_ai	overall				0.0!	0.0!	0.0!	-0.1!	0.0!	0.0	100	100	100	102
C2_ai	cat1-A				-0.1!	-0.1!	0.1!	-0.1!	-0.2!		100	100	98	97
C2_ai	cat1-B				-0.0	-0.0					100	102	101	98
C2_ai	cat3-fused				0.1	0.1	0.0	0.0	0.0	0.0	100	100	104	106
C2_ai	cat3-frame				-0.0	-0.0				-0.0	101	101	96	101
C2_ai	overall				-0.0!	-0.0!	0.1!	-0.1!	-0.2!	-0.0	100	101	99	98
CW_ai	cat1-A	100.0	100.0								101	99	101	105
CW_ai	cat1-B	100.0									101	101	96	104
CW_ai	cat3-fused	100.0	100.0	100.0							100	99	101	106
CW_ai	cat3-frame	100.0		100.0							101	101	112	113
CW_ai	overall	100.0	100.0!	100.0							101	100	100	106
CY_ai	cat1-A				0.0	0.0	0.0	0.0	0.0		101	100	100	100
CY_ai	cat3-fused				0.0	0.0	0.0	0.0	0.0	0.0	100	99	104	104
CY_ai	cat3-frame				-0.0	-0.0				0.0	101	101	104	105
CY_ai	overall				0.0	0.0	0.0	0.0	0.0	0.0	101	100	102	101

NOTE --- Condition CY metrics reported using Hausdorff PSNR.



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