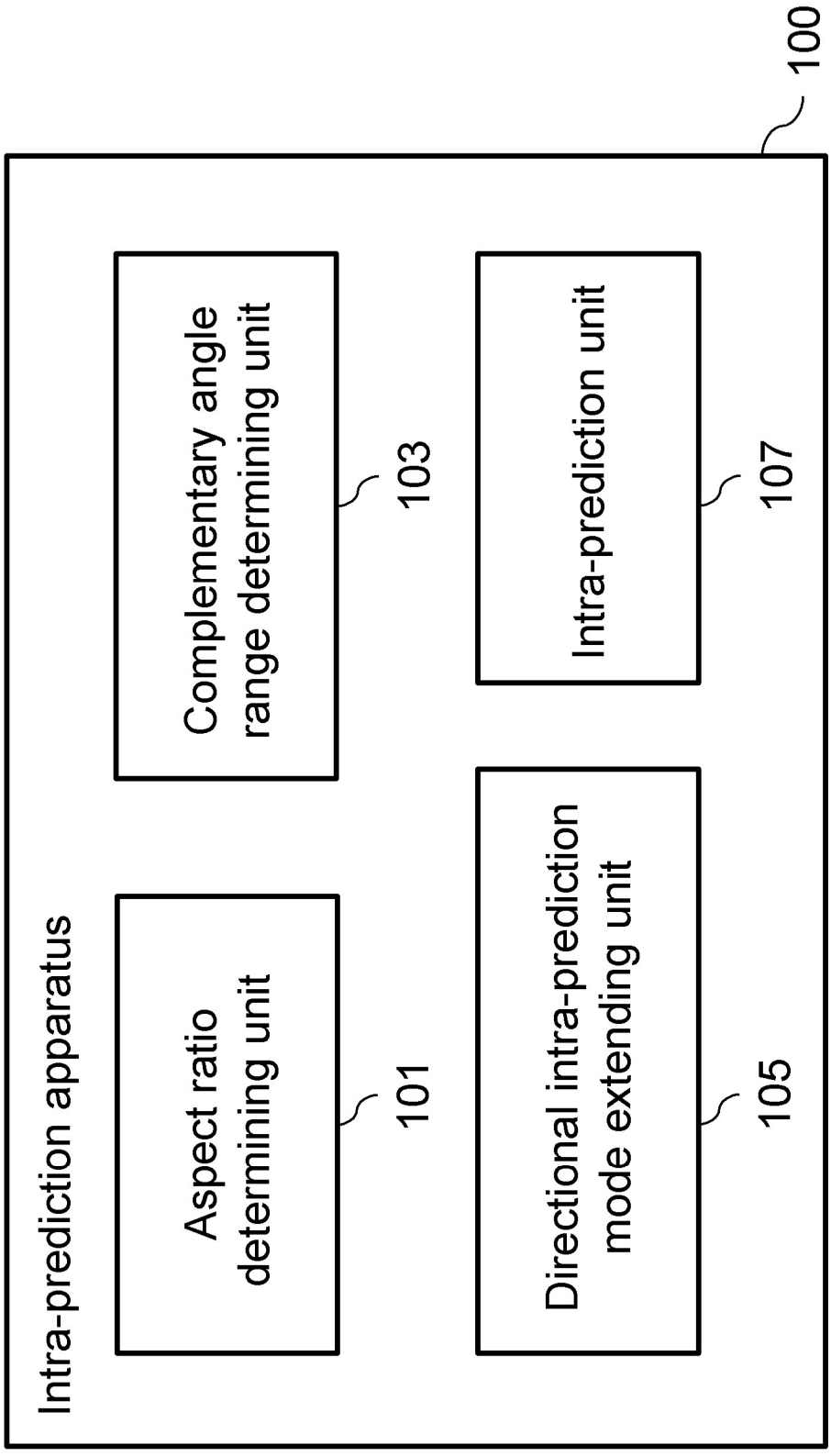

Intra-prediction apparatus
Aspect ratio determining unit
101
Complementary angle range determining unit
103
Directional intra-prediction mode extending unit
105
Intra-prediction unit
107
100

FIG.1

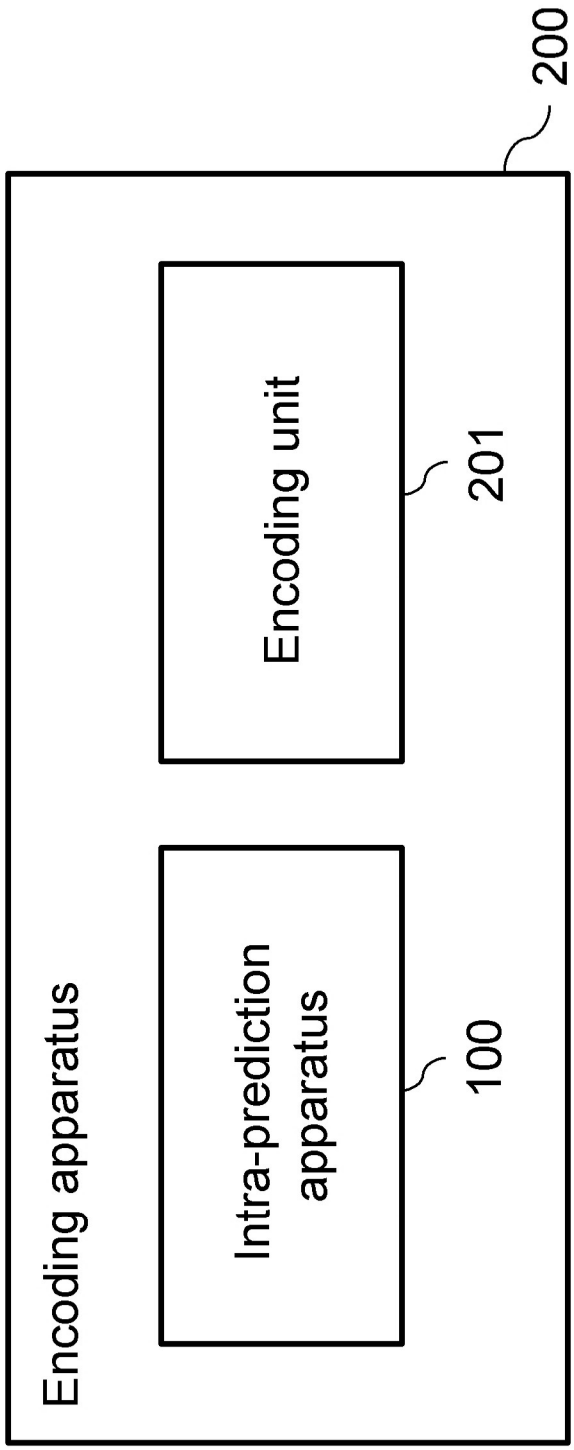

200
Encoding apparatus
Intra-prediction apparatus
100
Encoding unit
201

FIG.2

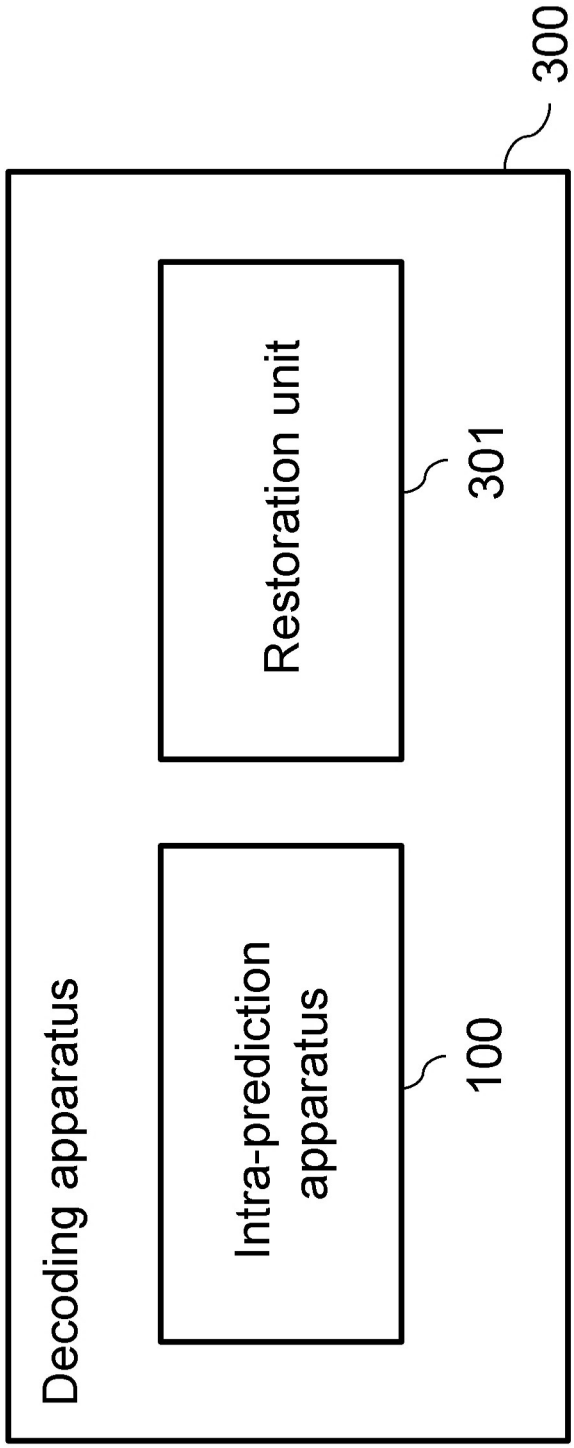

300
Decoding apparatus
Intra-prediction apparatus
100
Restoration unit
301

FIG.3

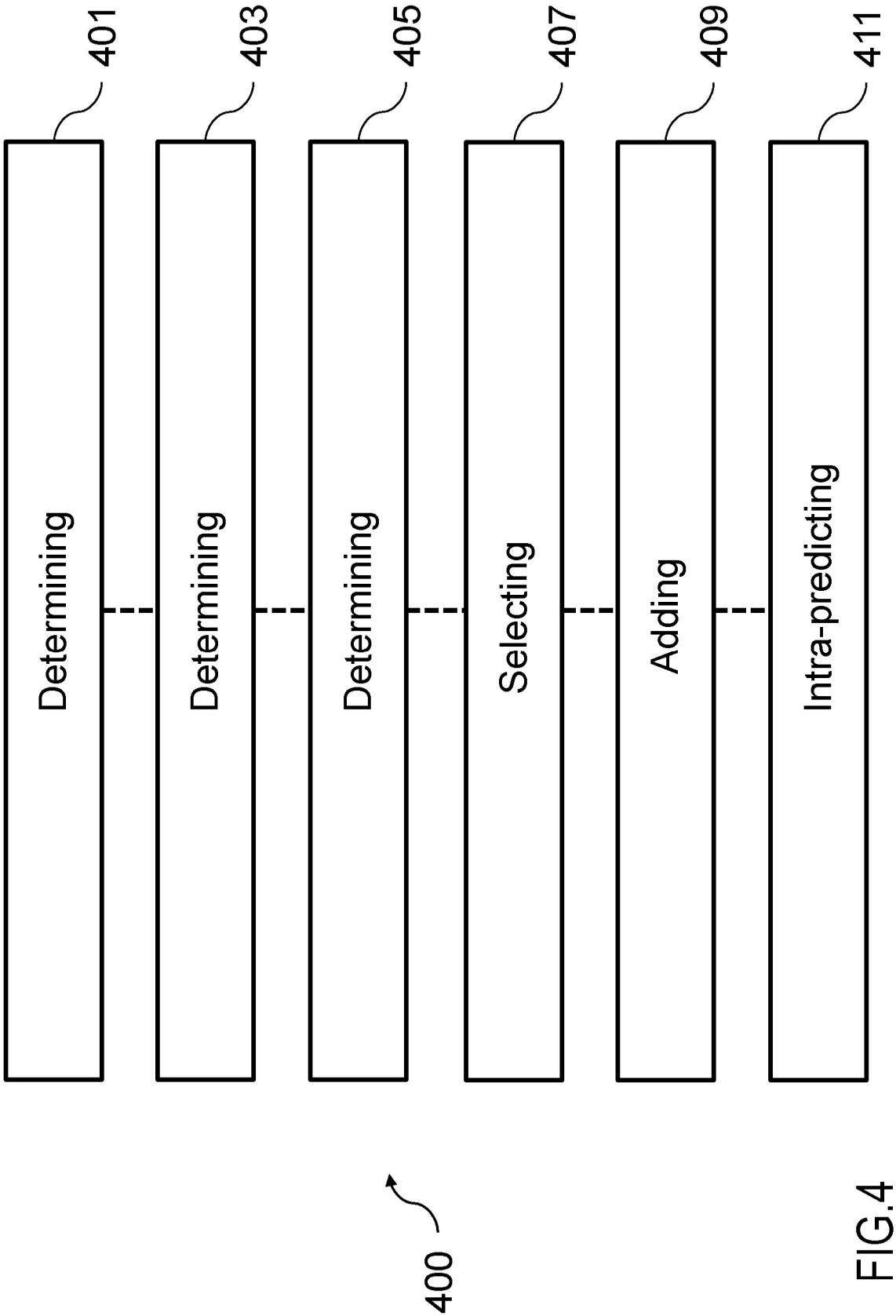

401
403
405
407
409
411
Determining
Determining
Determining
Selecting
Adding
Intra-predicting
400

FIG.4

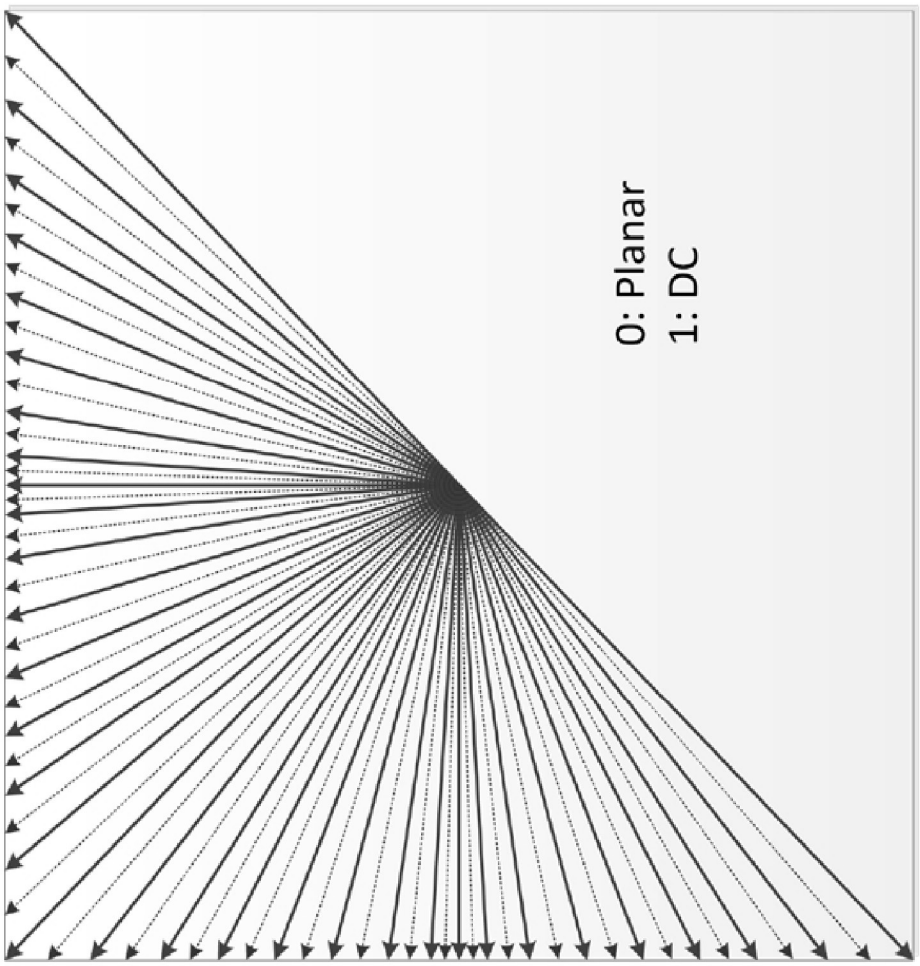


FIG.5

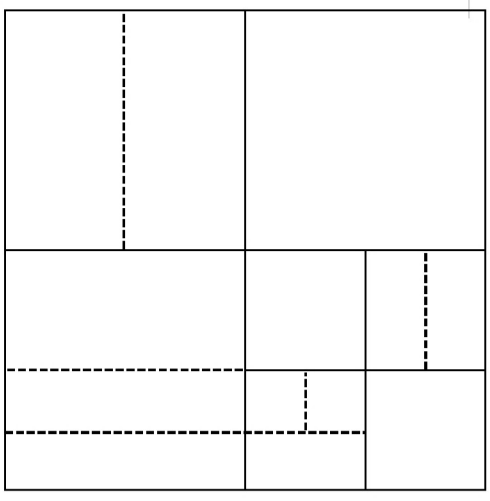


FIG.6 (a)

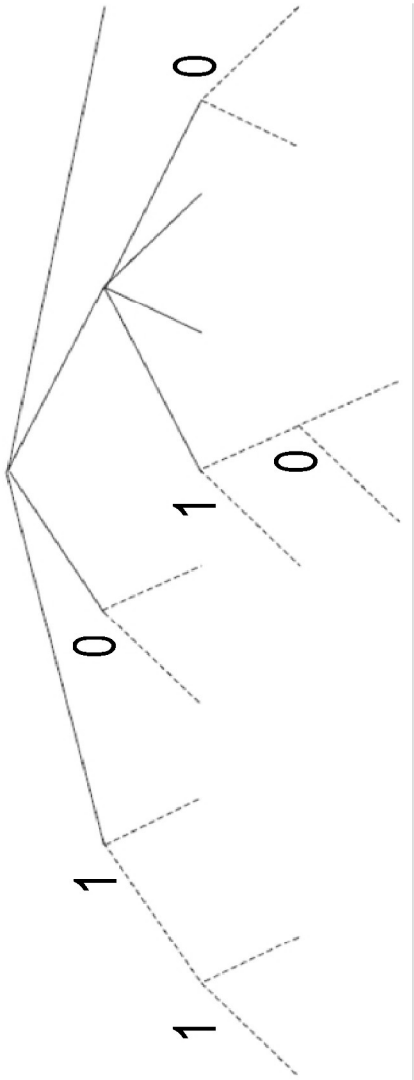


FIG.6 (b)

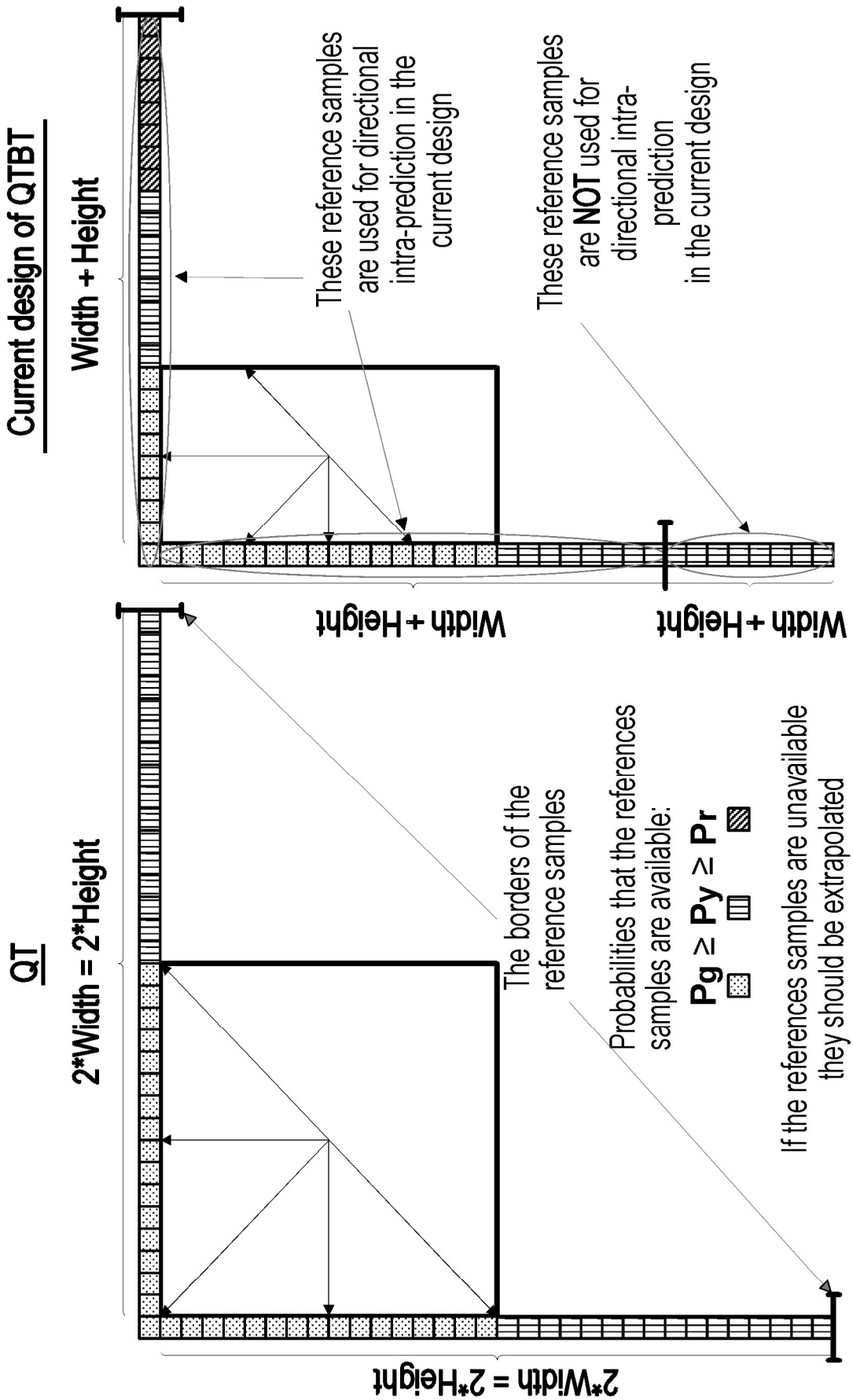

QT
2*Width = 2*Height
2*Width = 2*Height
The borders of the reference samples
Probabilities that the references samples are available:
Pg ≥ Py ≥ Pr
If the references samples are unavailable they should be extrapolated
Current design of QTBT
Width + Height
Width + Height
Width + Height
These reference samples are used for directional intra-prediction in the current design
These reference samples are NOT used for directional intra-prediction in the current design

FIG.7 (a)

FIG.7 (b)

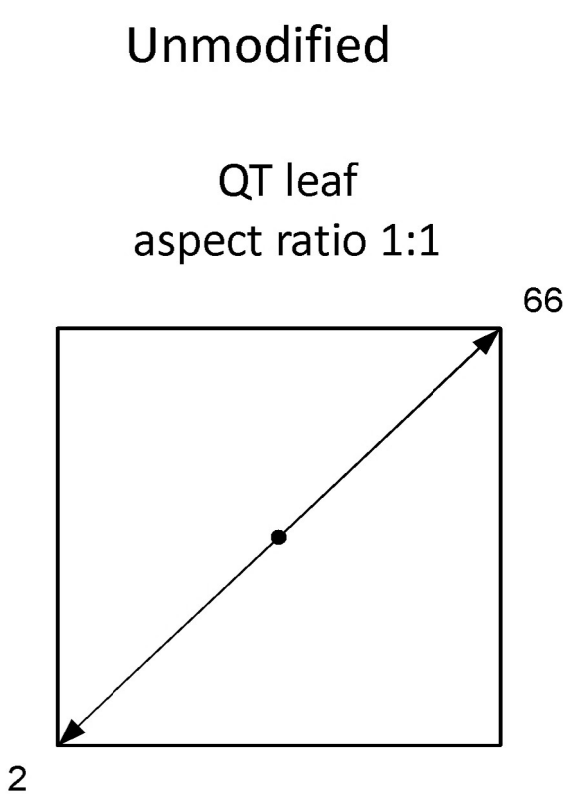

Unmodified
QT leaf
aspect ratio 1:1
66
2

FIG.8 (a)

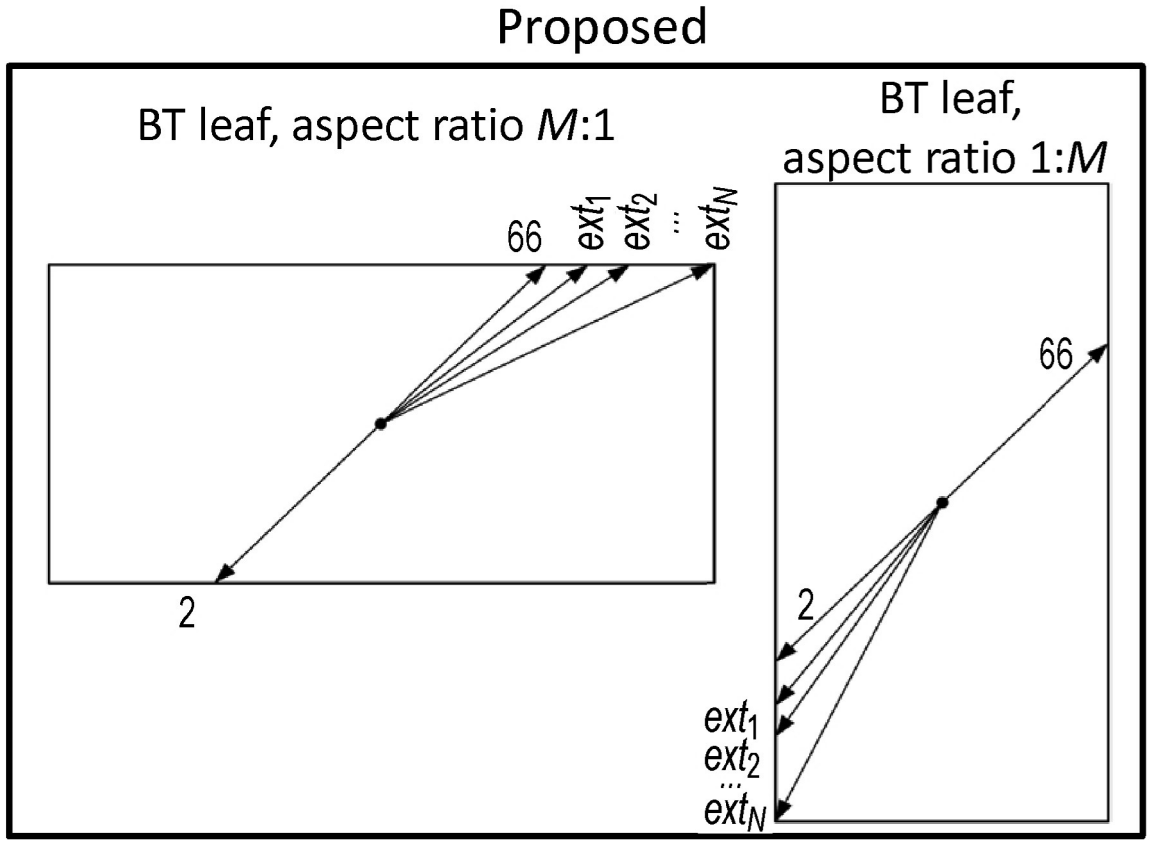

Proposed
BT leaf, aspect ratio M:1
BT leaf,
aspect ratio 1:M
66
ext1
ext2
...
extN
2
66
2
ext1
ext2
...
extN

FIG.8 (b)

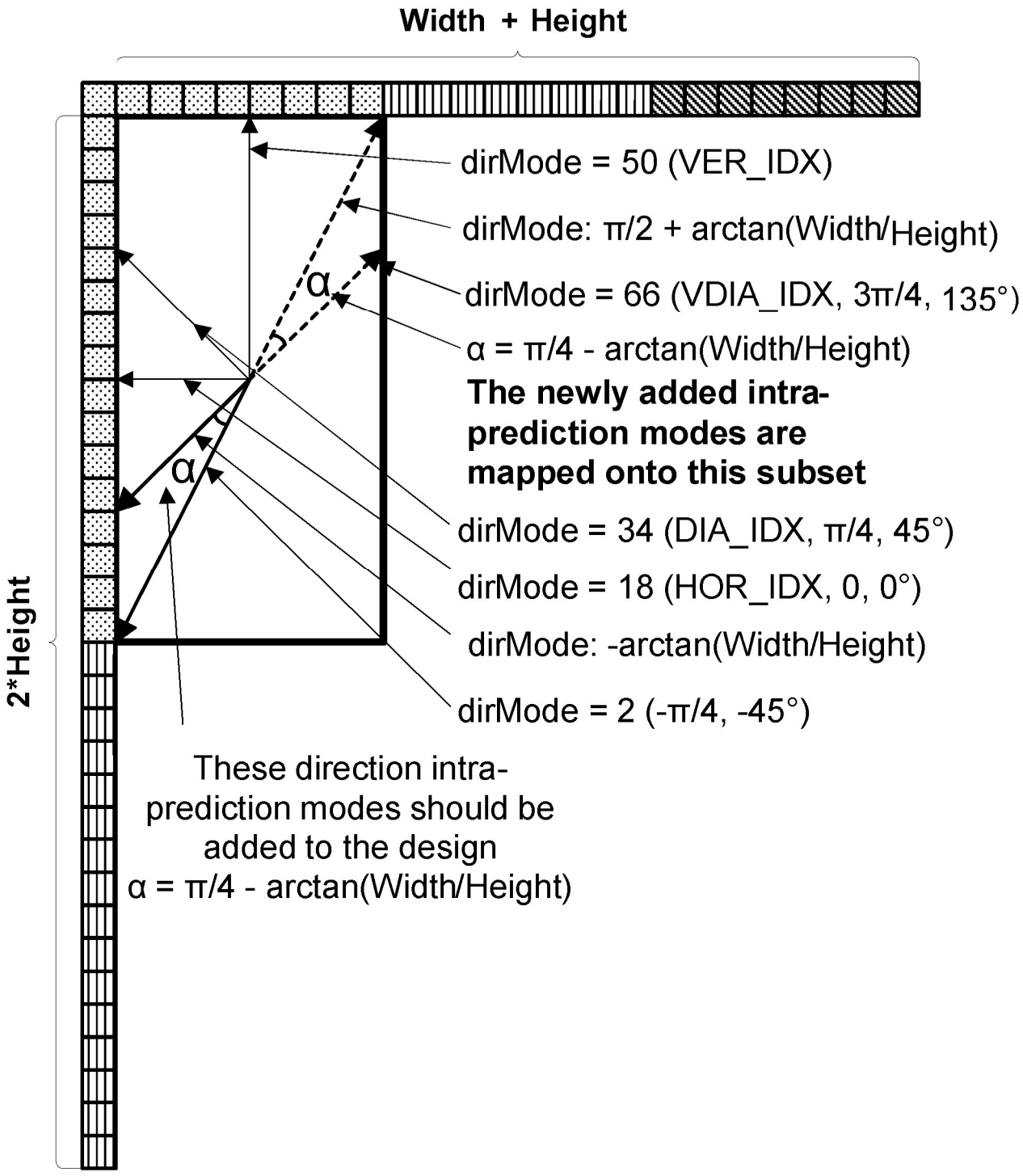

Width + Height
2*Height
dirMode = 50 (VER_IDX)
dirMode: π/2 + arctan(Width/Height)
dirMode = 66 (VDIA_IDX, 3π/4, 135°)
α = π/4 - arctan(Width/Height)
The newly added intra-prediction modes are mapped onto this subset
dirMode = 34 (DIA_IDX, π/4, 45°)
dirMode = 18 (HOR_IDX, 0, 0°)
dirMode: -arctan(Width/Height)
dirMode = 2 (-π/4, -45°)
α
α
These direction intra-prediction modes should be added to the design
α = π/4 - arctan(Width/Height)

FIG.9

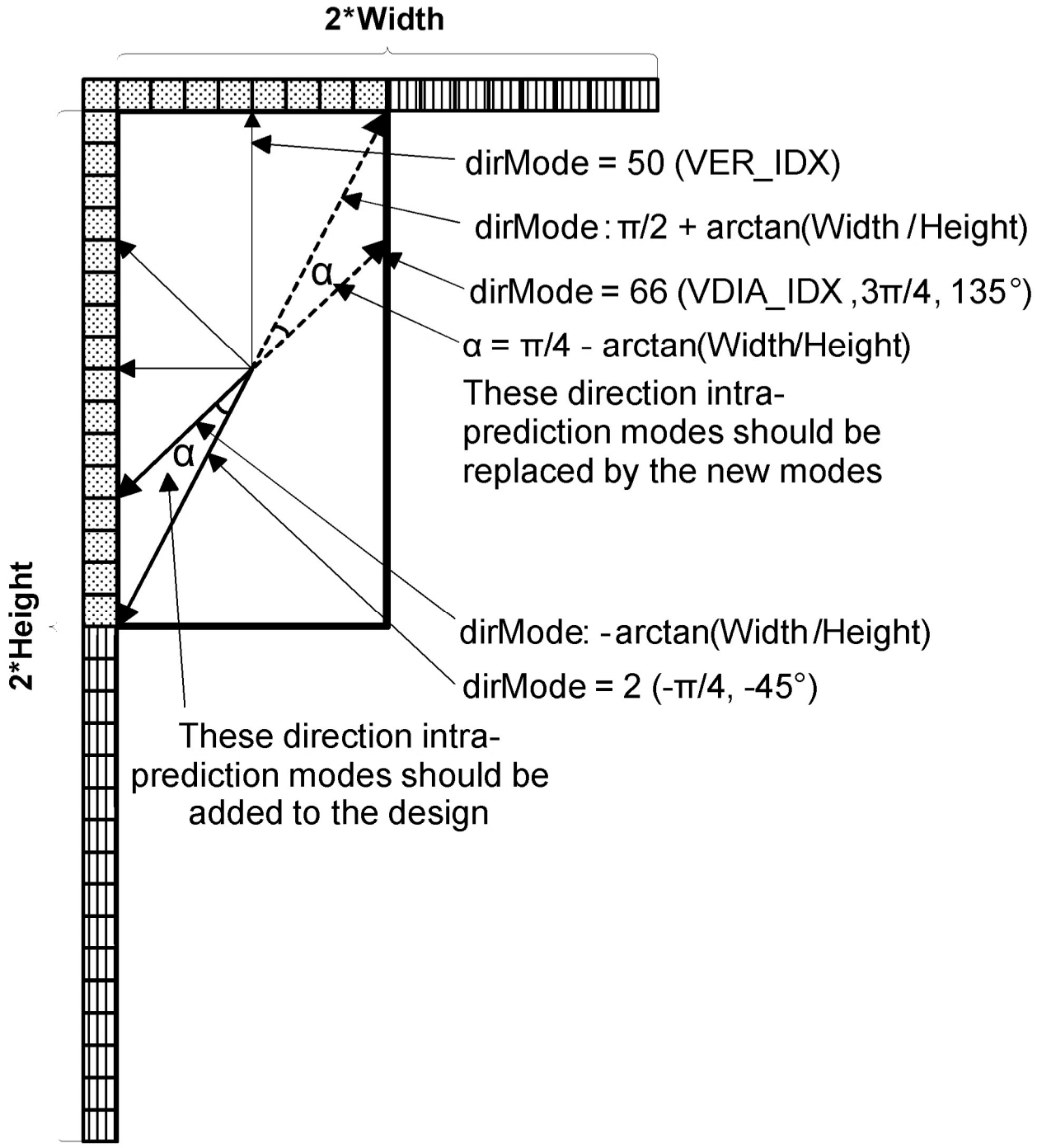

2*Width
2*Height
dirMode = 50 (VER_IDX)
dirMode : π/2 + arctan(Width / Height)
dirMode = 66 (VDIA_IDX , 3π/4, 135°)
α = π/4 - arctan(Width/Height)
These direction intra-prediction modes should be replaced by the new modes
α
α
dirMode: - arctan(Width / Height)
dirMode = 2 (-π/4, -45°)
These direction intra-prediction modes should be added to the design

FIG.10

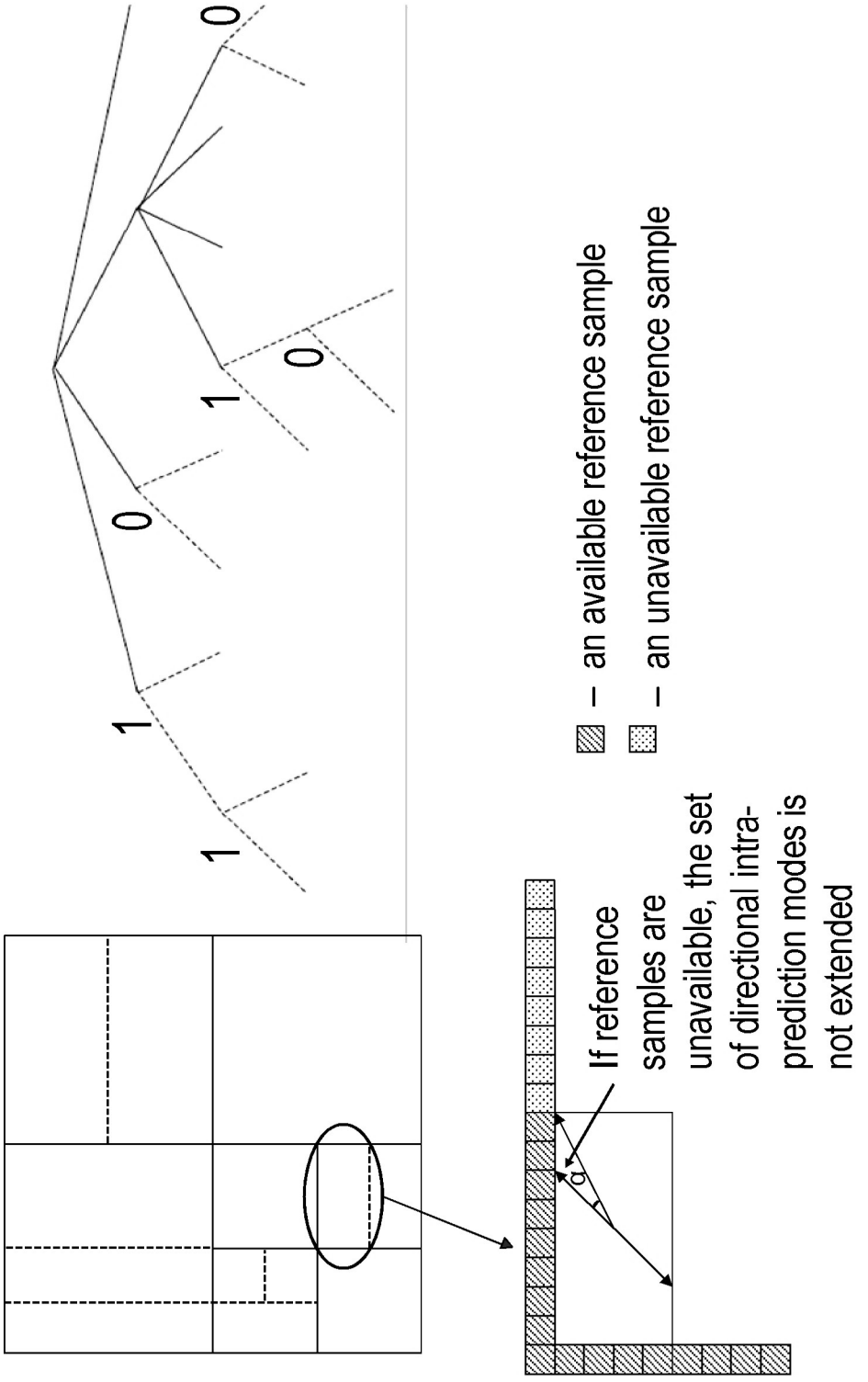

0
1
0
1
0
1
1
– an available reference sample
– an unavailable reference sample
If reference samples are unavailable, the set of directional intra-prediction modes is not extended
α

FIG.11

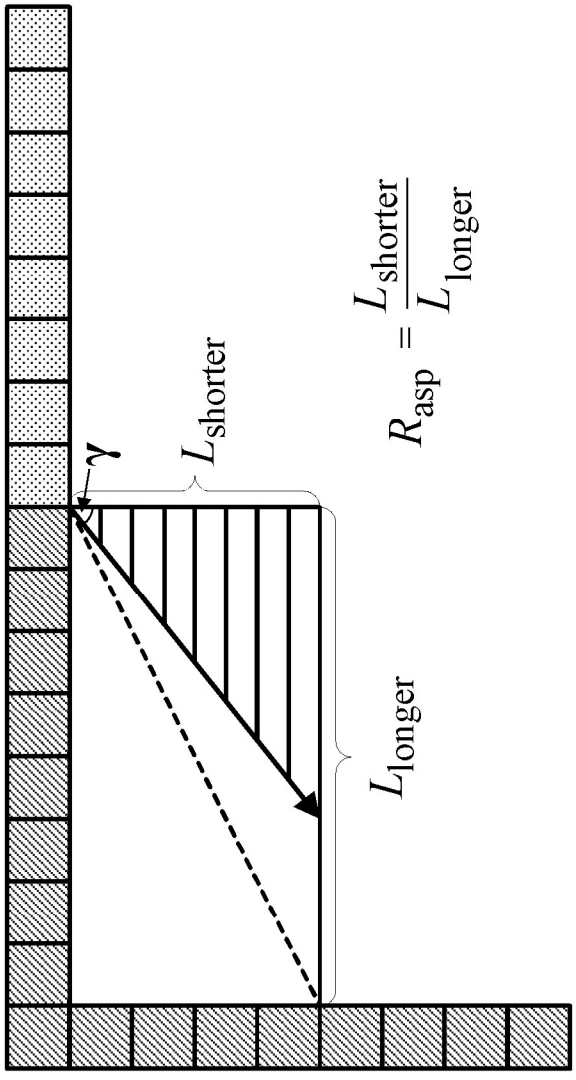


FIG.12

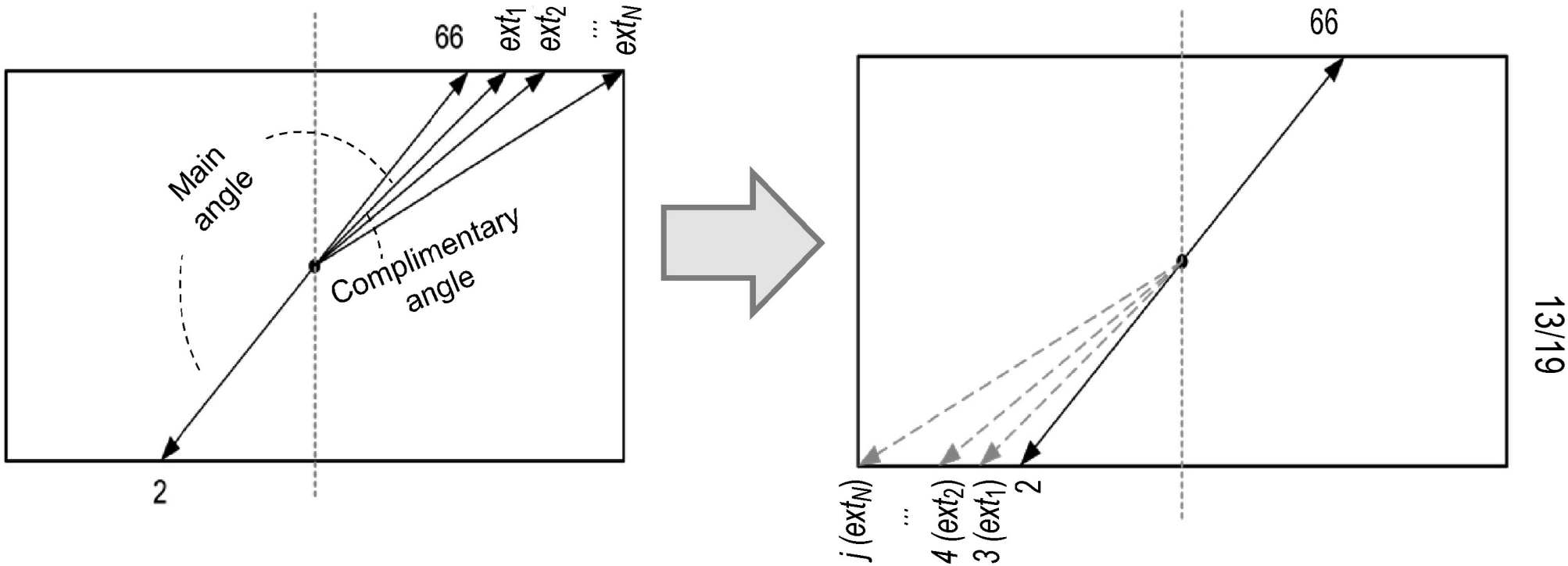

66
ext_1
ext_2
...
ext_N
Main angle
Complimentary angle
2
66
$j\ (ext_N)$
...
$4\ (ext_2)$
$3\ (ext_1)$
2

FIG.13

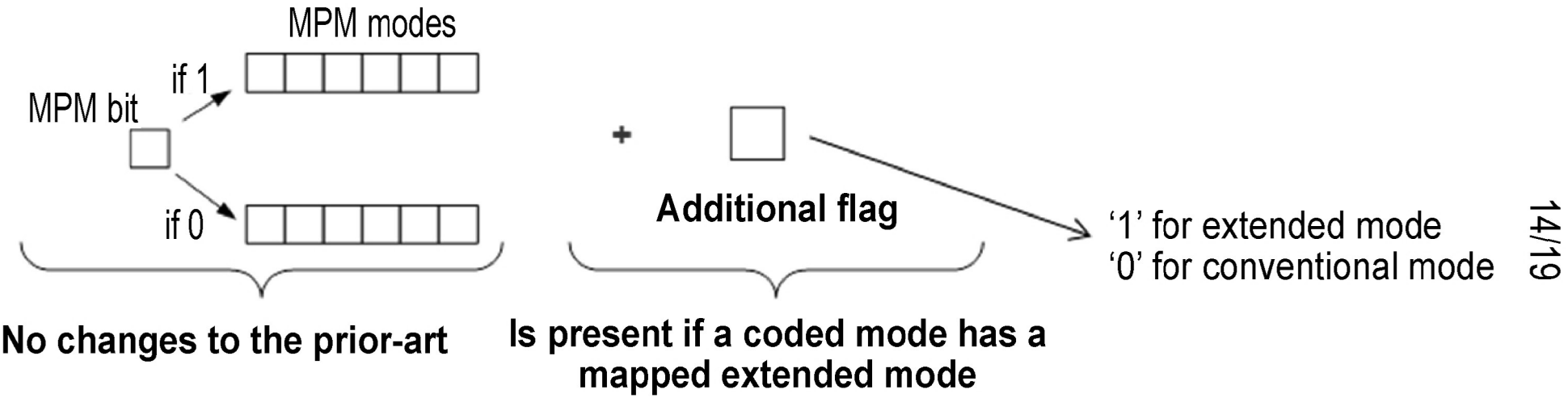
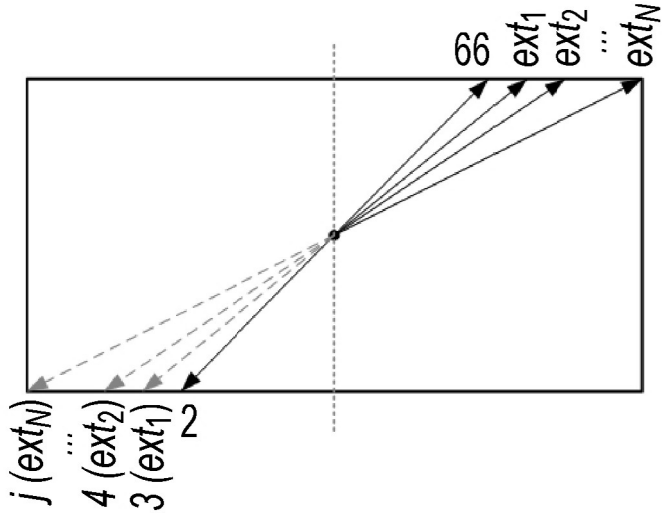

MPM modes
if 1
MPM bit
if 0
Additional flag
'1' for extended mode
'0' for conventional mode
No changes to the prior-art
Is present if a coded mode has a mapped extended mode

FIG.14

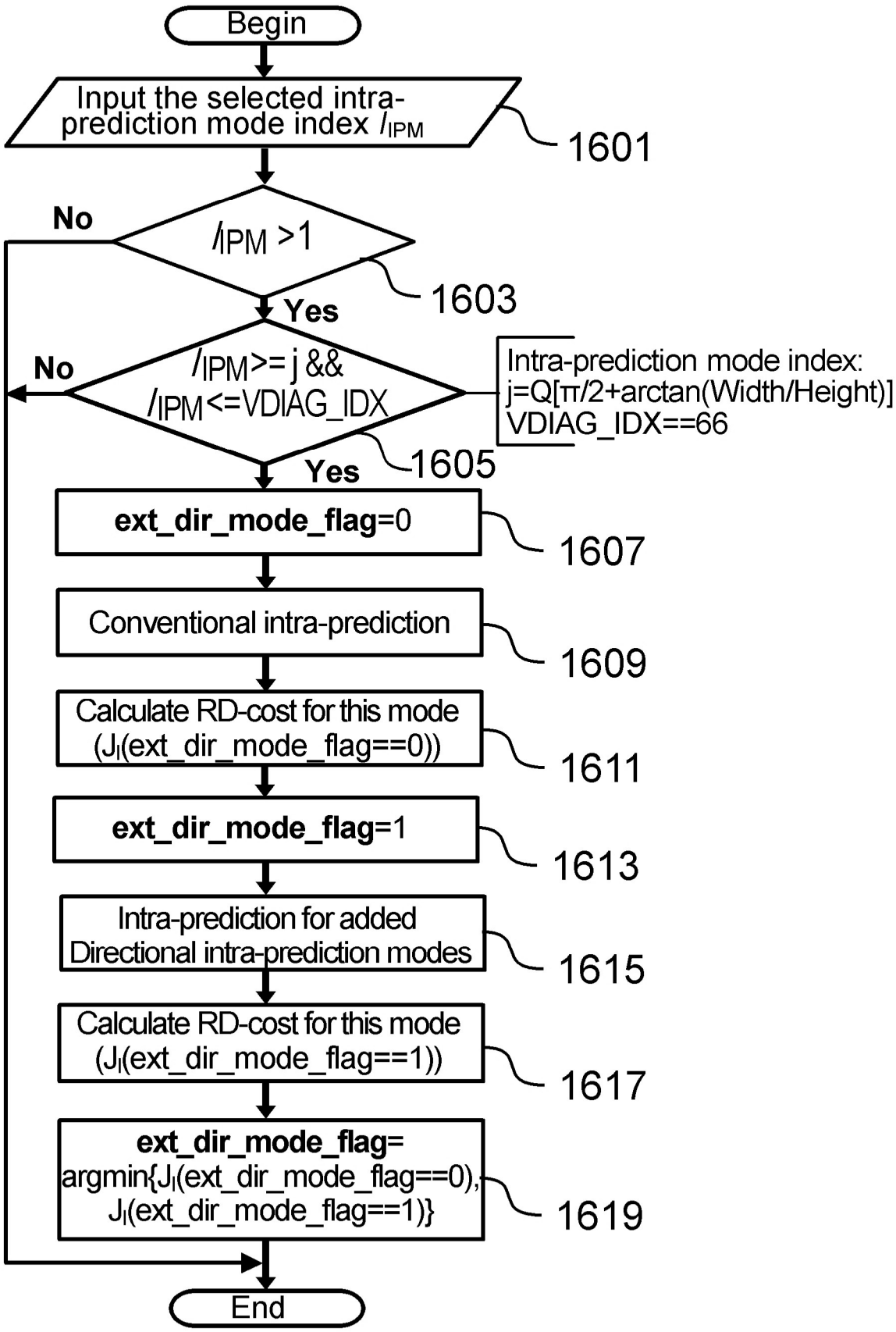
Decoded (effective) intra mode index	Encoded intra mode index	Additional Flag Value
2	2	0
3	3	0
	...	
j	*j*	0
j+1	*j*+1	N/A
	...	
66	66	N/A
ext_1	3	1
ext_2	4	1
	…	
ext_N	*j*	1



No additional signaling for these cases

FIG.15

FIG.16


Begin
Input the selected intra-prediction mode index I_{IPM}
1601
No
I_{IPM} >1
1603
Yes
No
I_{IPM}>= j && I_{IPM}<=VDIAG_IDX
Intra-prediction mode index:
j=Q[π/2+arctan(Width/Height)]
VDIAG_IDX==66
1605
Yes
ext_dir_mode_flag=0
1607
Conventional intra-prediction
1609
Calculate RD-cost for this mode (J_I(ext_dir_mode_flag==0))
1611
ext_dir_mode_flag=1
1613
Intra-prediction for added Directional intra-prediction modes
1615
Calculate RD-cost for this mode (J_I(ext_dir_mode_flag==1))
1617
ext_dir_mode_flag= argmin{J_I(ext_dir_mode_flag==0), J_I(ext_dir_mode_flag==1)}
1619
End

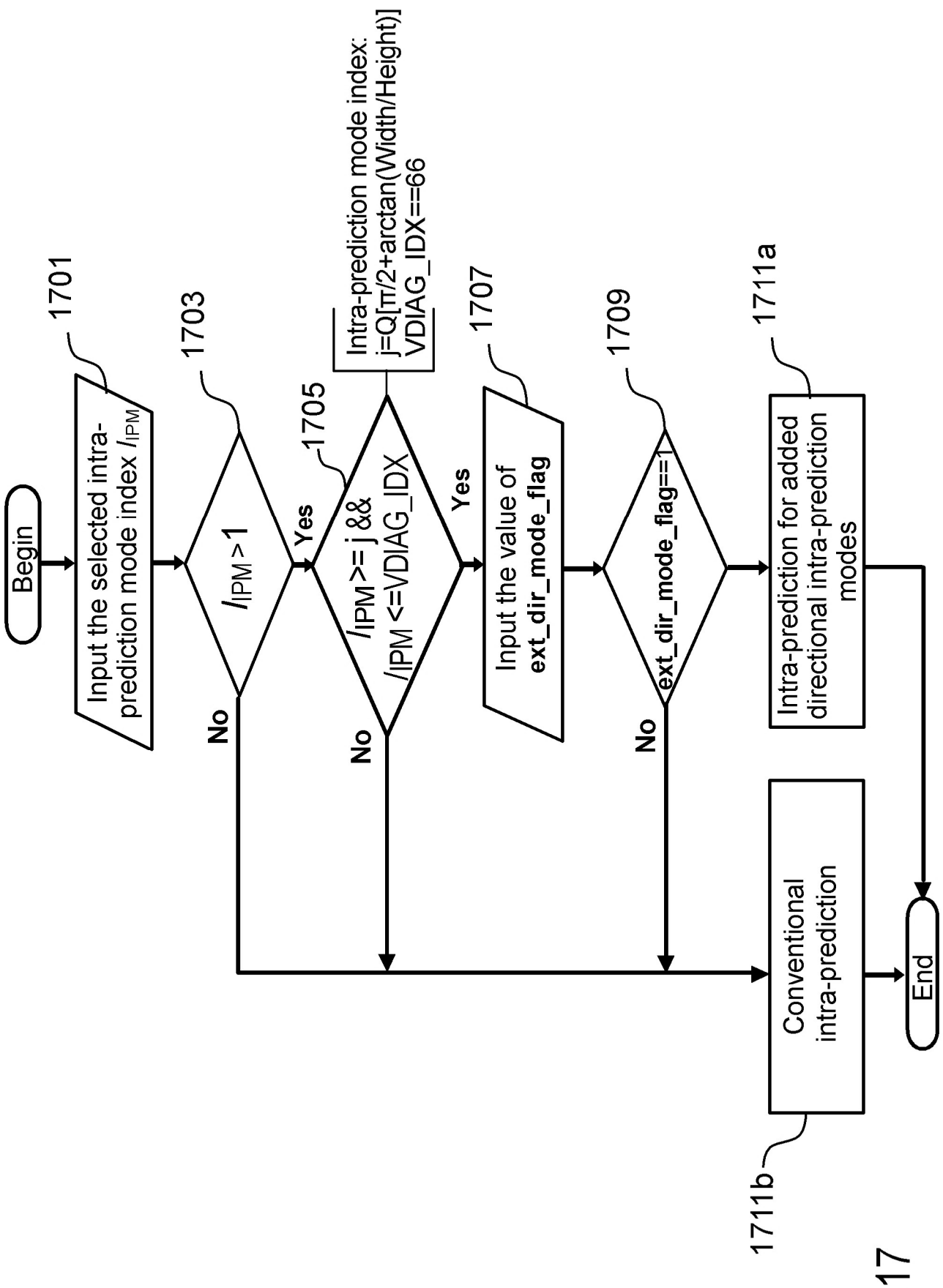

Begin
Input the selected intra-prediction mode index I_{IPM}
1701
I_{IPM}>1
1703
No
Yes
I_{IPM}>= j && I_{IPM} <=VDIAG_IDX
1705
No
Intra-prediction mode index:
j=Q[π/2+arctan(Width/Height)]
VDIAG_IDX==66
Yes
Input the value of ext_dir_mode_flag
1707
ext_dir_mode_flag==1
1709
No
Intra-prediction for added directional intra-prediction modes
1711a
Conventional intra-prediction
1711b
End

FIG.17

FIG.18 (a)

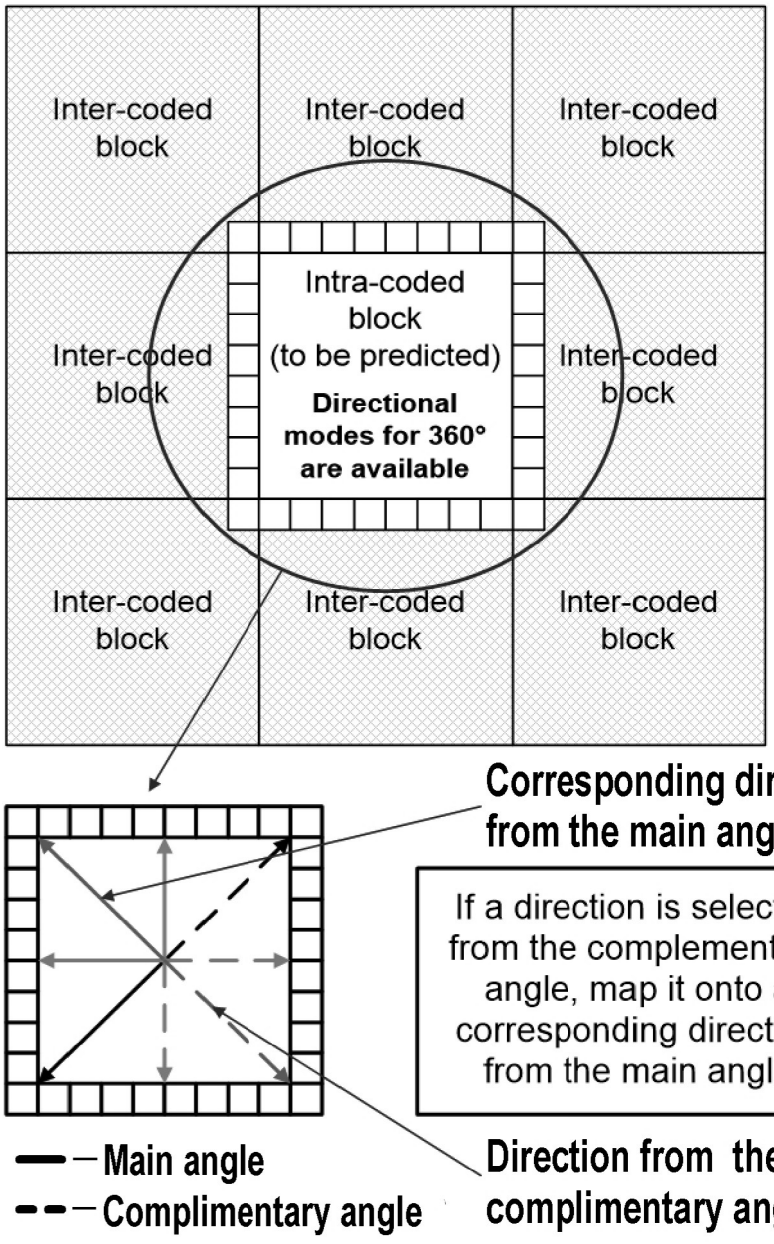
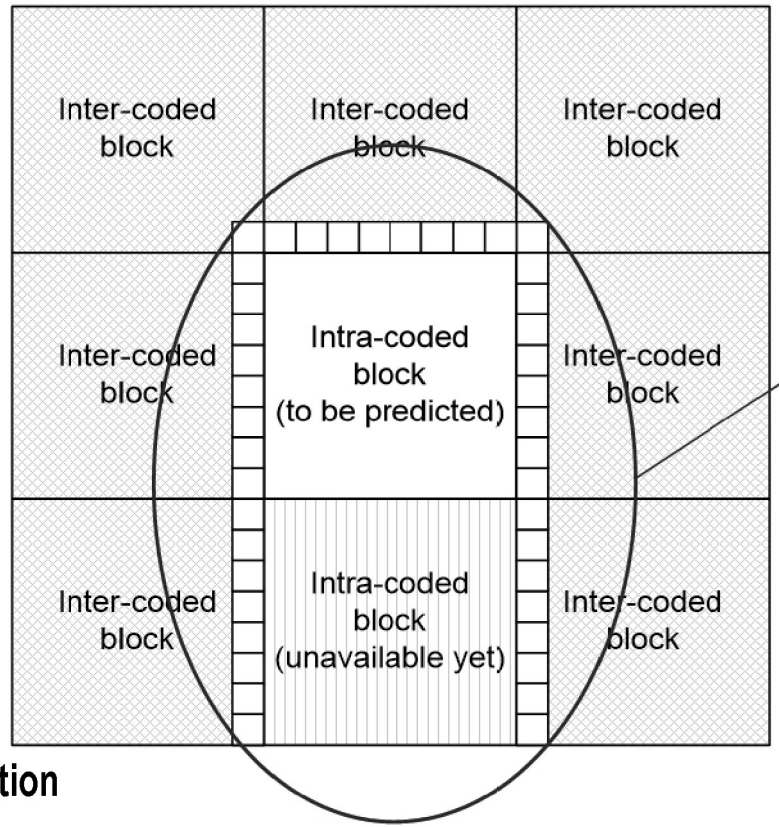
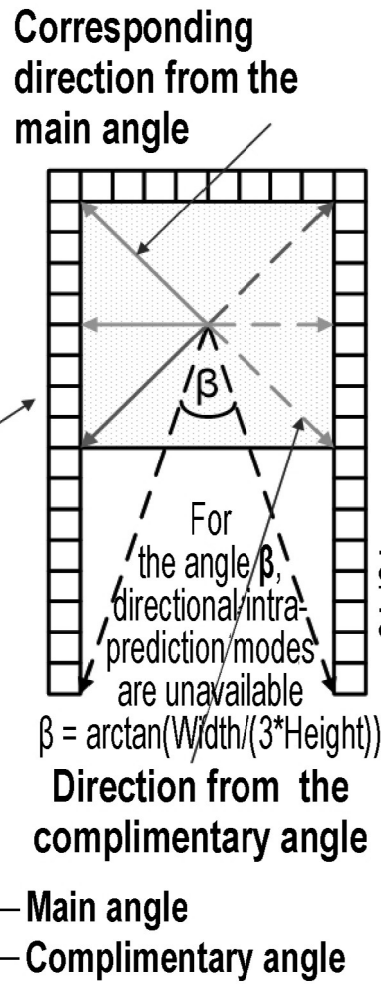


FIG.18 (b)





If a direction is selected from the complementary angle, map it onto a corresponding direction from the main angle

Set the one-bit flag ON if the direction is selected from the complementary angle. Otherwise, set it OFF

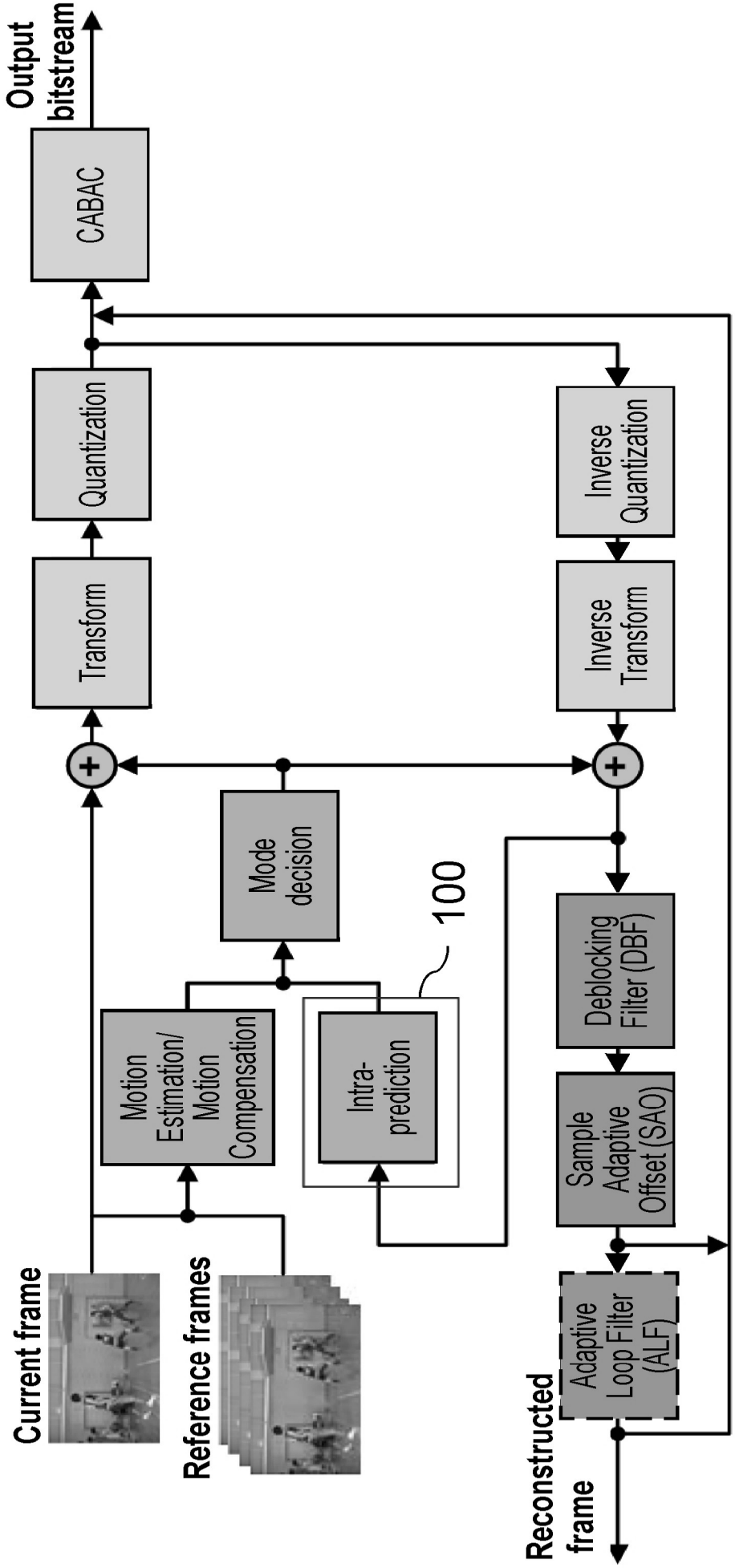

Output bitstream
CABAC
Quantization
Transform
Inverse Quantization
Inverse Transform
Mode decision
100
Motion Estimation/ Motion Compensation
Intra-prediction
Deblocking Filter (DBF)
Sample Adaptive Offset (SAO)
Adaptive Loop Filter (ALF)
Current frame
Reference frames
Reconstructed frame
200

FIG.19