Overview

The Block–based Coder Mode in an Object–based Analysis–Synthesis Coder

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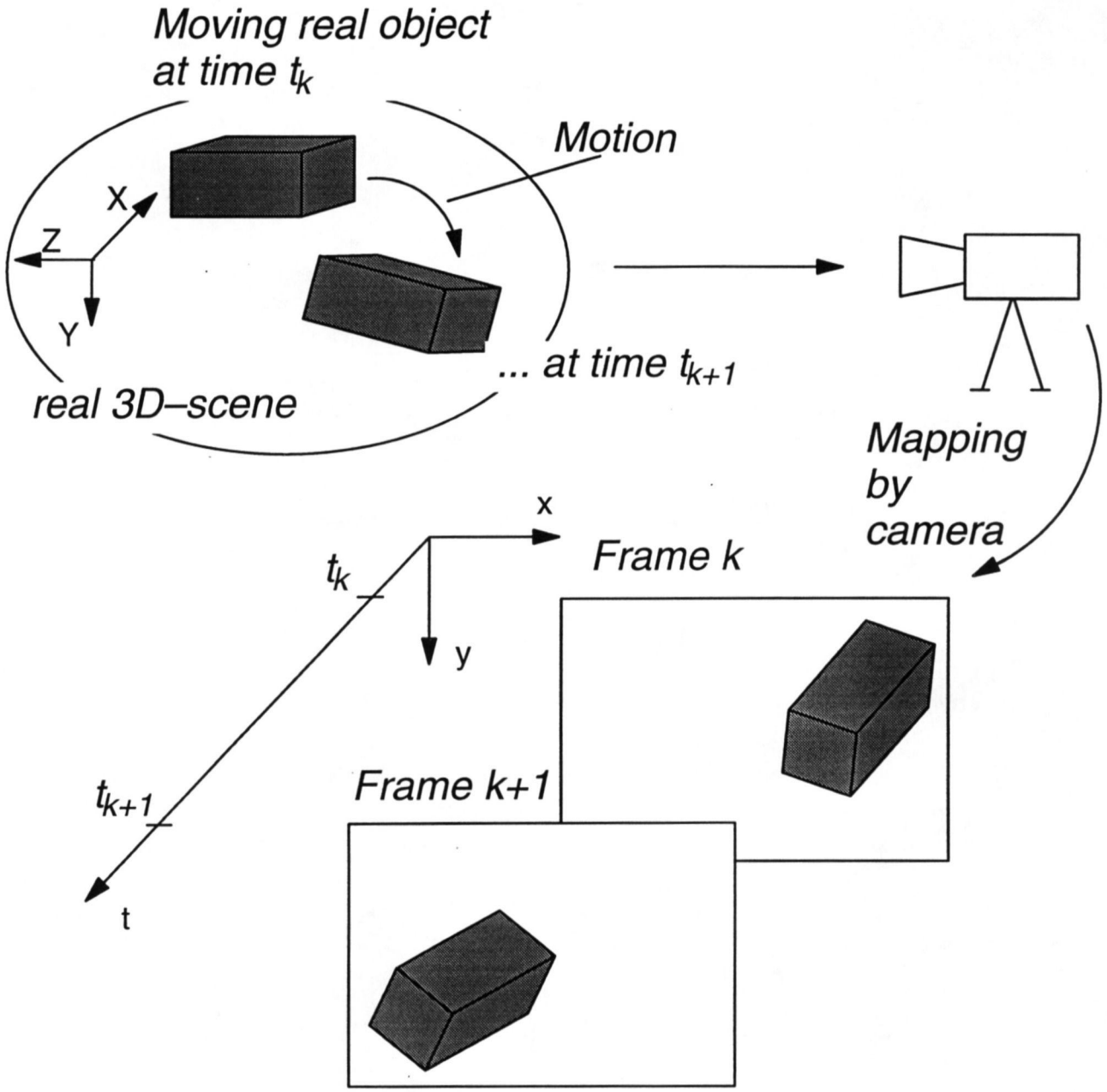
- Object–based Analysis–Synthesis Coder
- Block–based Reference Coder
- Data Rates
- Conclusions



SOURCE MODEL:
DESCRIPTION OF THE FRAME–TO–FRAME DIFFERENCES BY THE MOTION OF MODEL OBJECTS

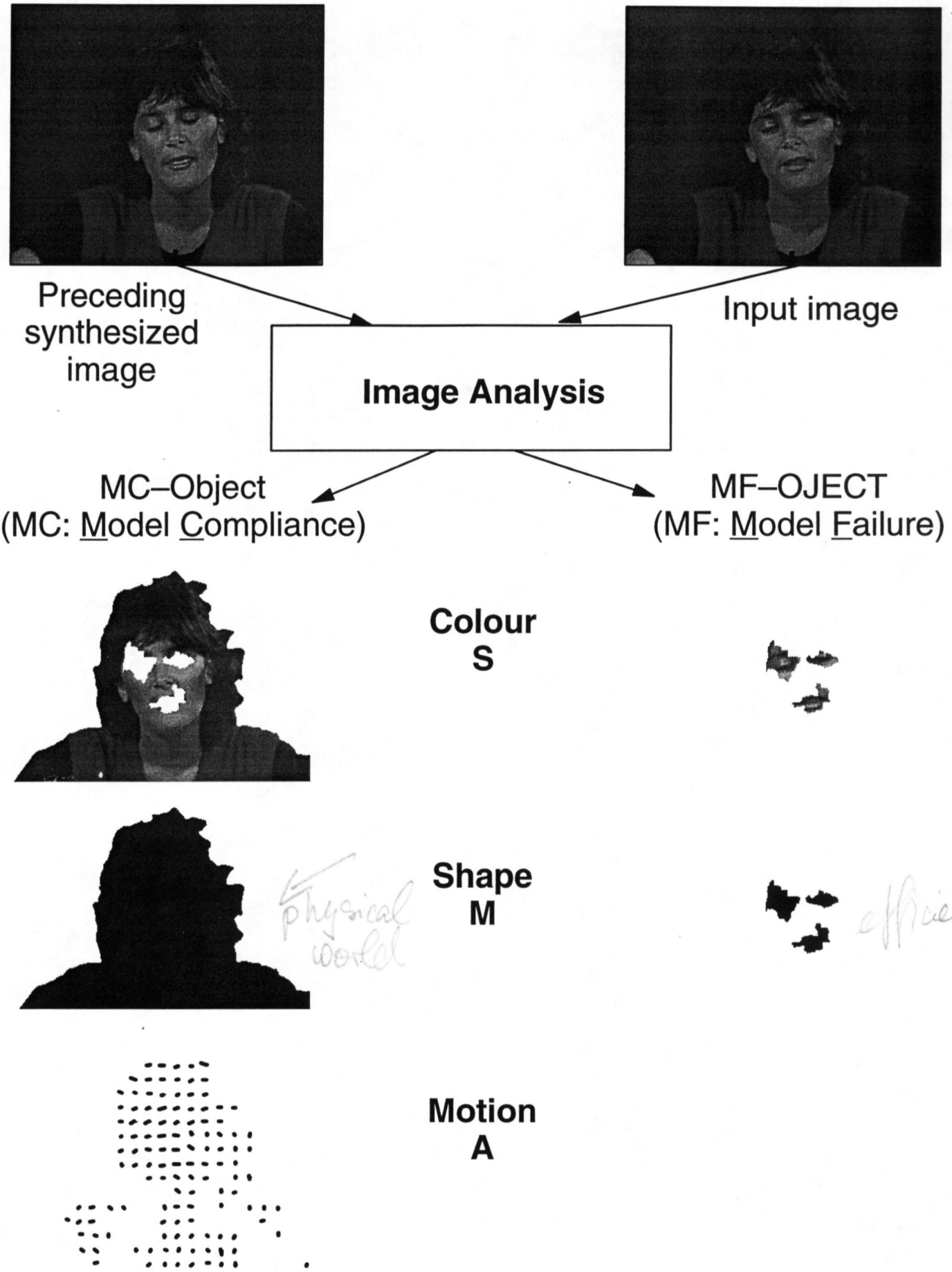
Source Models in Image Coding

H.261/MPEG1/MPEG2:

- Source model: Translatorically moving square blocks
- Model parameters: Motion, colour
- Limitations:
  - ♦ boundaries of moving objects
  - ♦ prediction image subjectivley unpleasant
  - ♦ low irrelevance reduction

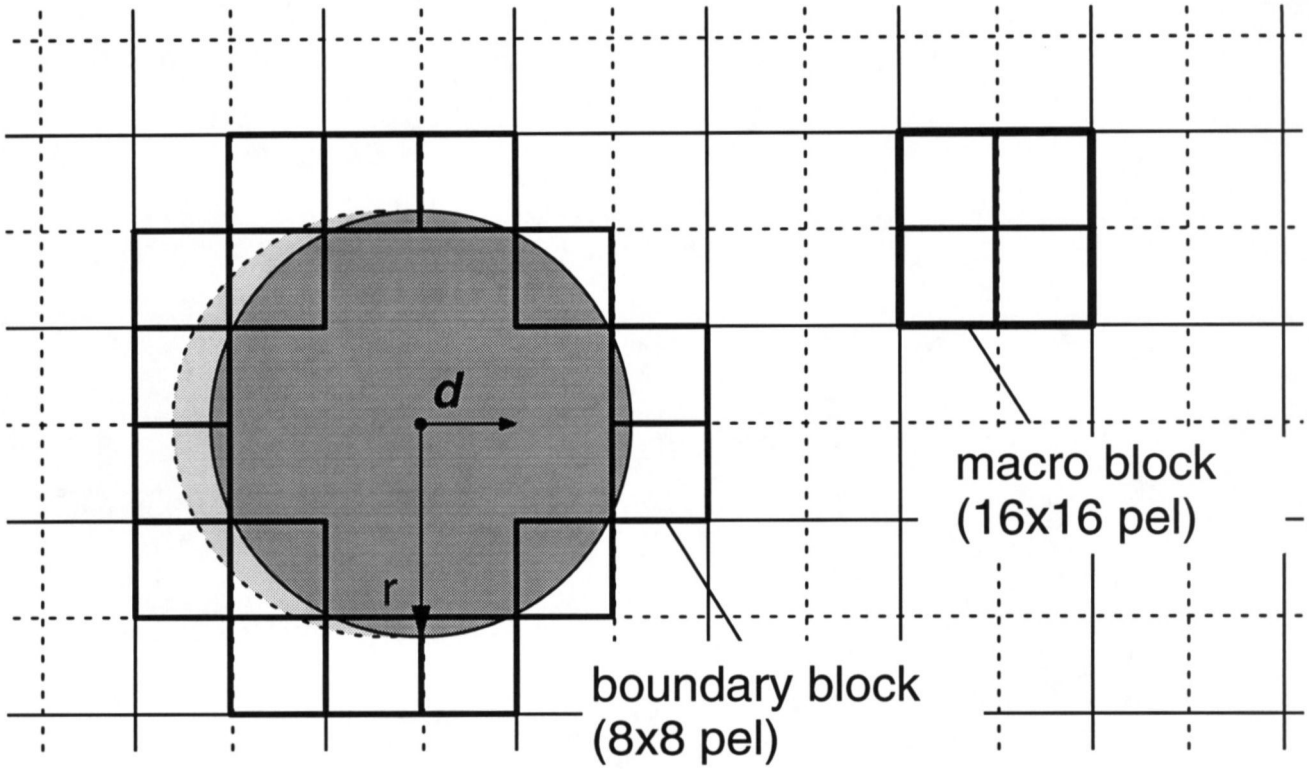
Object–based Analysis–Synthesis Coding (OBASC):

- Source model: Moving 2D flexible objects
- Model parameters: Motion, colour and SHAPE
- Advantages:
  - ♦ boundaries of moving objects
  - ♦ subjectively correct prediction image
  - ♦ higher irrelevance reduction
- Disadvantage:
  - ♦ additional parameter set



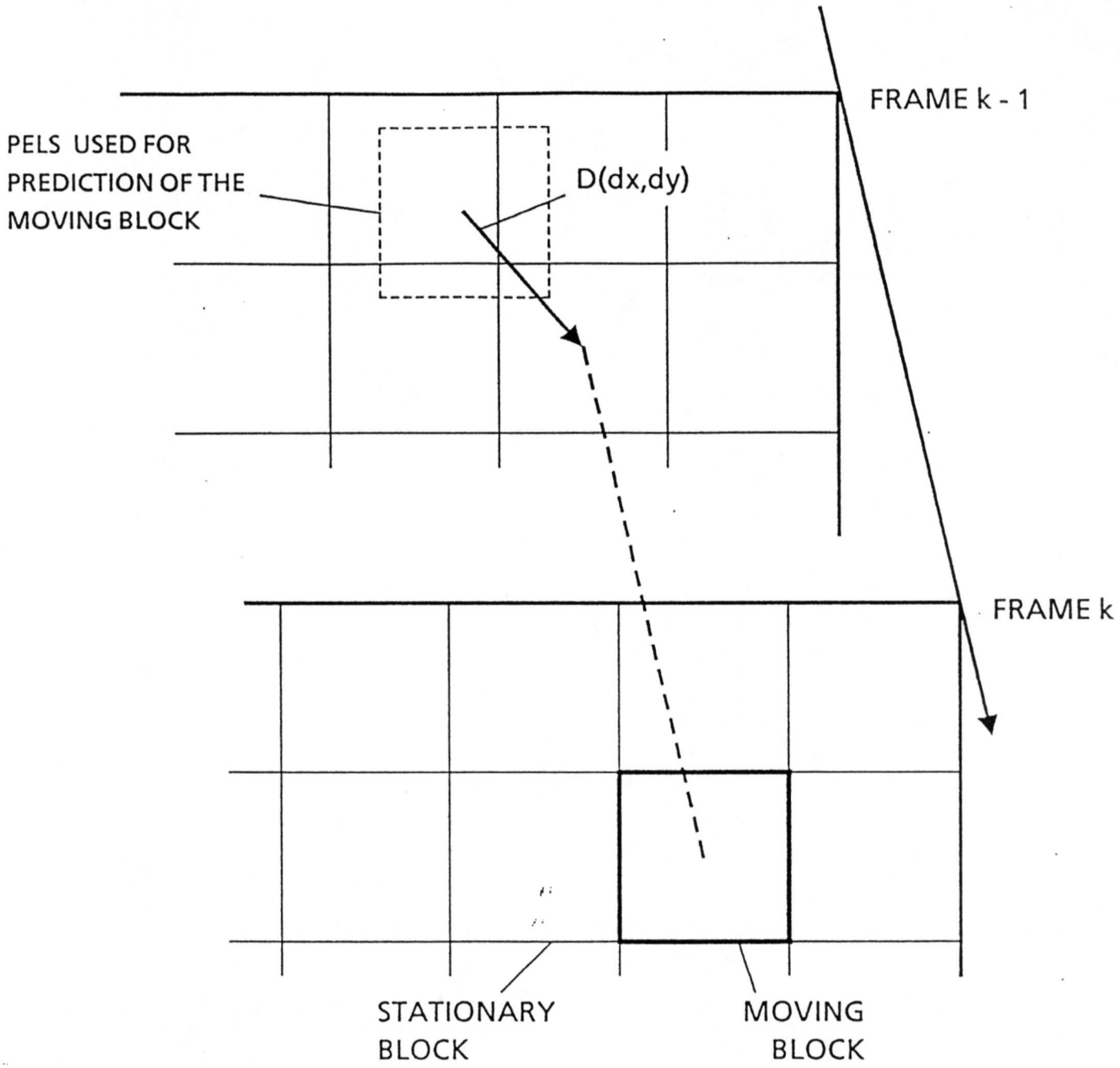
DETERMINATION OF MC–OBJECTS AND MF–OBJECTS

OBASC: Parameter Coding



Parameter sets to code:

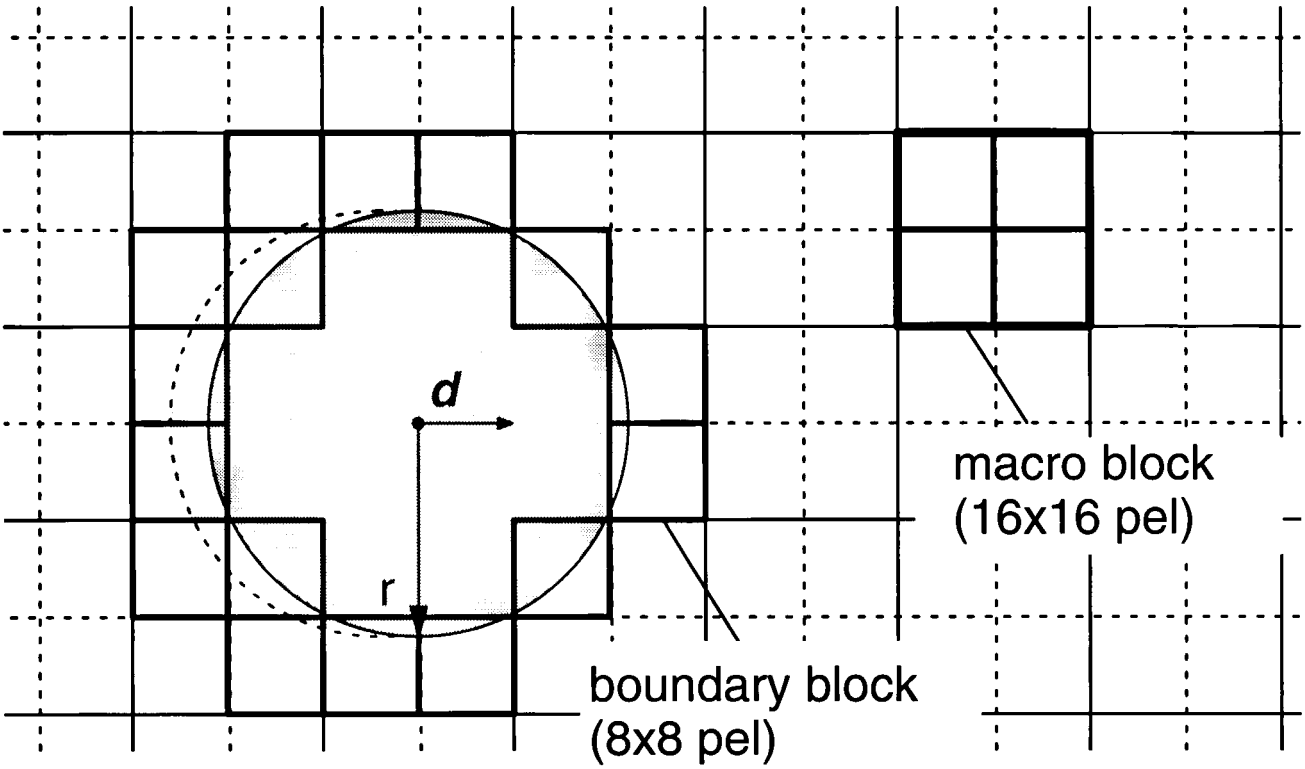
- motion parameters
- shape update parameters
- color parameters of uncovered areas



D(dx,dy) = Displacement

ILLUSTRATION OF MOTION COMPENSATED PREDICTION

Block–based Reference Coder



Parameter sets to code:

- motion parameters
- color parameters of boundary blocks

Block–based Reference Coder

New features to be added to H.261

Motion compensation

- Displacement vectors with 0.5 pel accuracy (Rate like OBASC)
- Interpolation of displacement vector field

Color coding

- Shape transmission
- Coding of color parameters inside coded shape

Differences to OBASC

- No shape parameters related to real world
- Different coding of boundary blocks

Comparison OBASC/RM8

- CIF, 10 Hz
- 64 kbit/s
- original first frame

Data Rates: Mode Selection

Differences in boundary blocks

Block–based

$$R^B = \sum_{\text{boundary blocks}} R_C^B$$

Object–based

$$R^O = \sum_{\text{boundary blocks}} (R_{F,MC}^O + R_{C,UA}^O)$$

Coder mode selection

$$\text{coding mode} = \begin{cases} \text{block–based} & \text{if } R^B < R^O \\ \text{object–based} & \text{else} \end{cases}$$

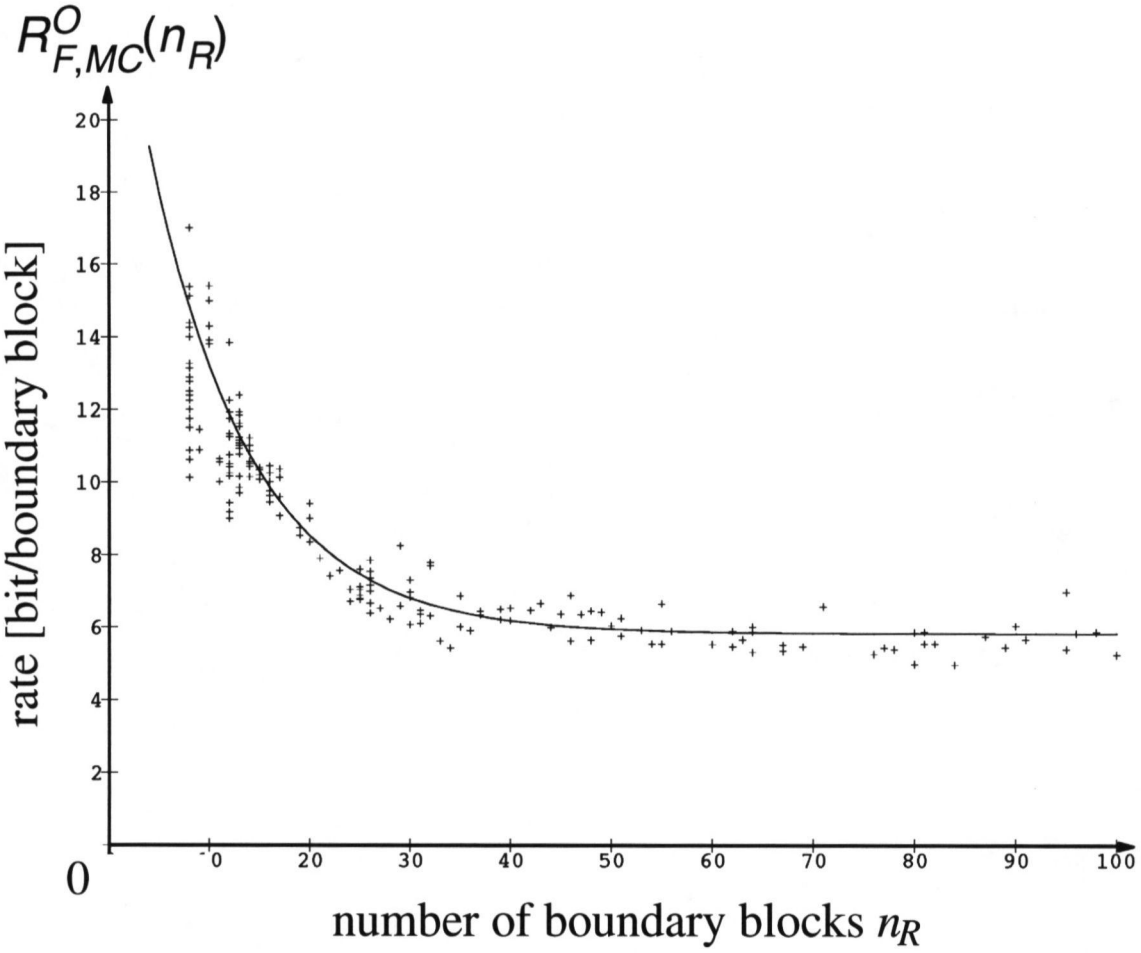
R_C^B rate for color parameters of boundary blocks

$R_{C,UA}^O$ rate for color parameters of uncovered areas

$R_{F,MC}^C$ rate for shape parameters fo MC–Object

Data Rates: Shape Parameters

Lossy coding of shape parameters (d^*_{max}=1.4 pel)



Model curve

$$R^O_{F,MC}(n_R) \approx M \cdot (e^{-0.1 \cdot (n_R - 30)} + 5.8)$$

[bit/boundary block]

Data Rates: Color Parameters

Color parameters object–based

$$R^{O}_{C,UA} = n_{UA} \cdot r_{C,UA}$$

- $7 \leq n_{UA} \leq 10$ pel
- $0 \leq r_{C,UA} \leq 1$ bit/pel (36 dB)

n_{UA}: size of uncovered area
$r_{C,UA}$: rate for coding color parameters of uncovered area

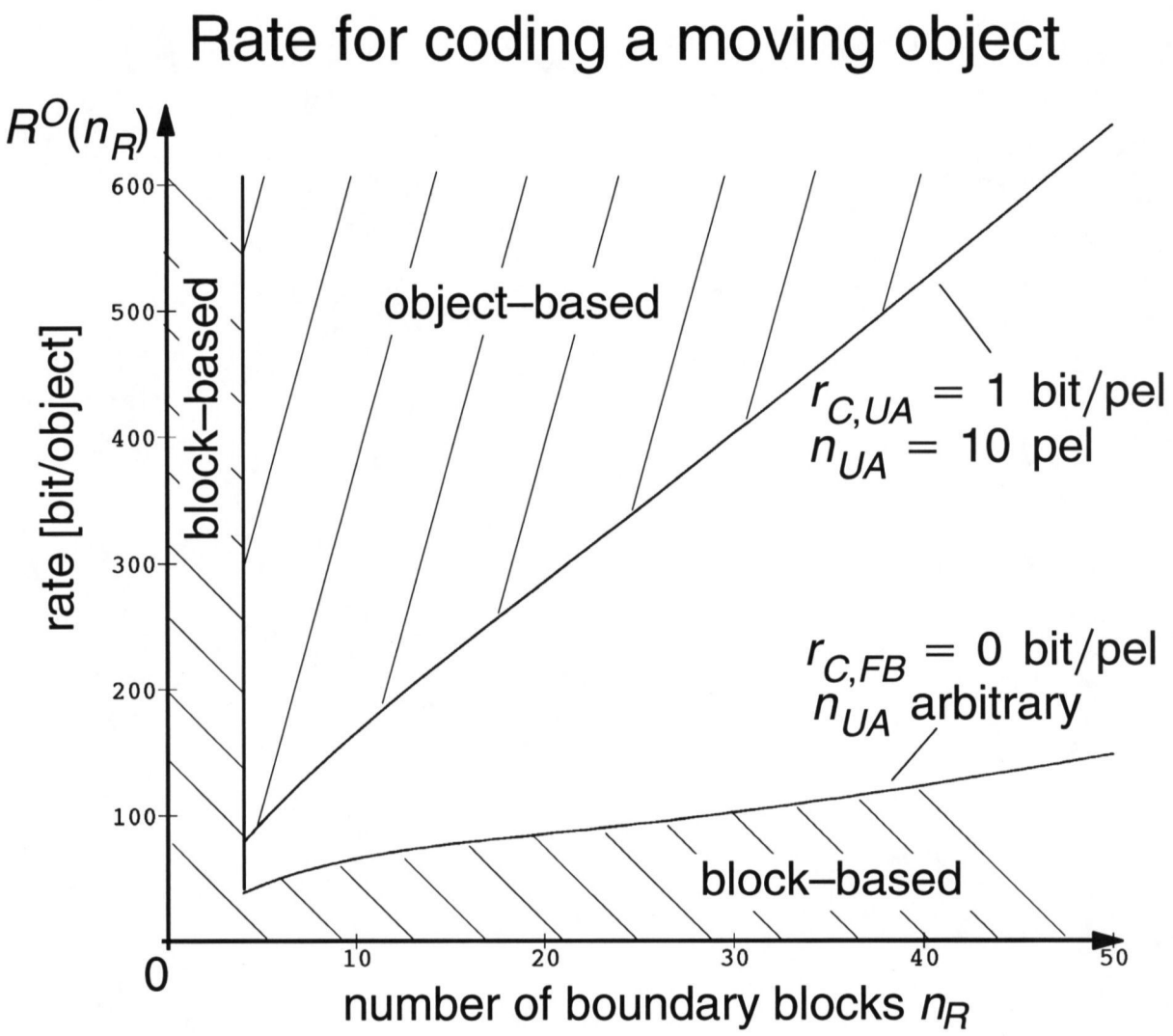
Color parameters block–based

$$R^{B}_{C,} = n_{B} \cdot r_{C,B}$$

- n_B=64 pel
- $r_{C,B} \geq 1$ bit/pel (42 dB)

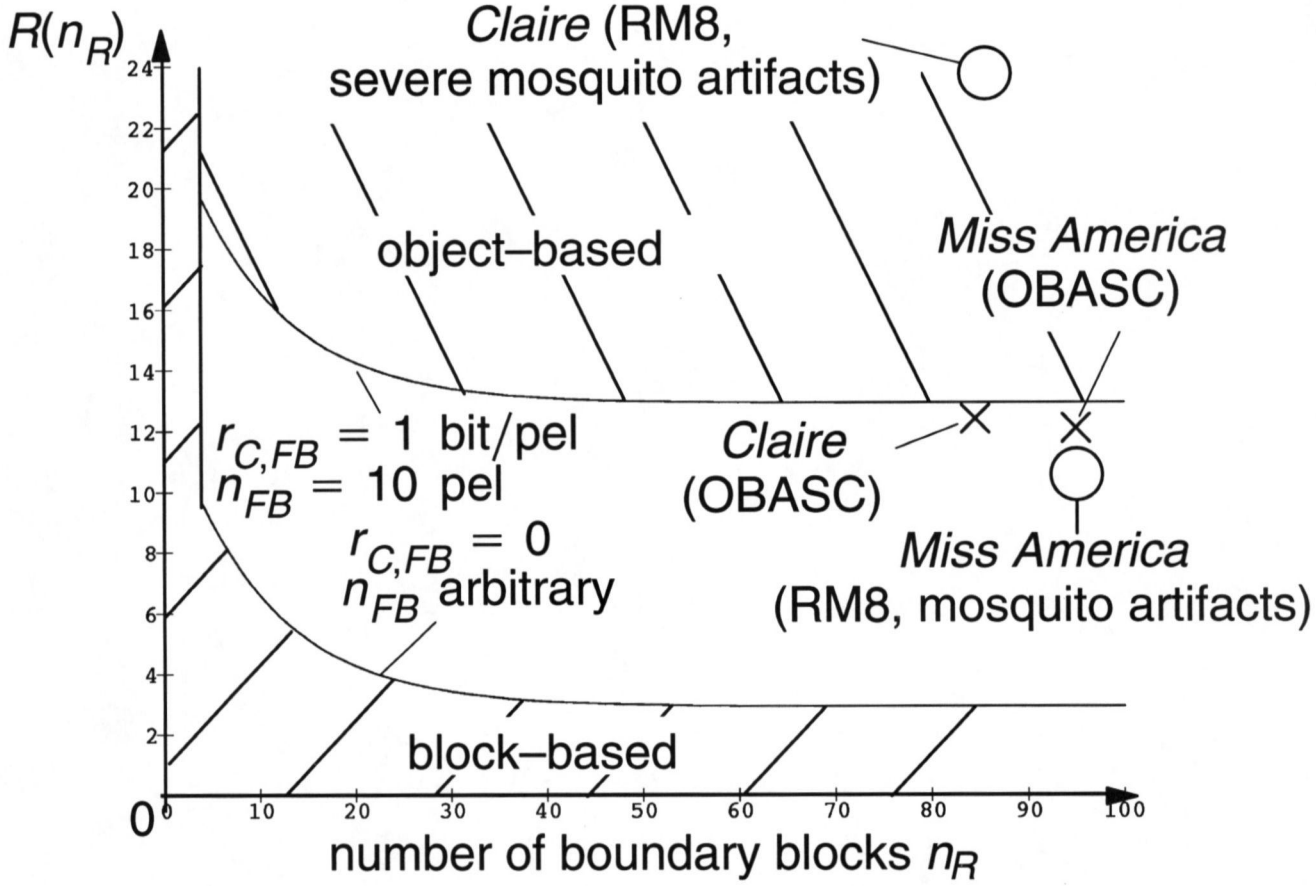
n_B: size of block
$r_{C,B}$: rate for coding color parameters of block

Data Rates: Comparison



Data Rates: Comparison

Rate for coding a moving object
[bits/boundary block]



Objects smaller than 256 pels to be coded block–based

Large objects to be coded object–based

Conclusions

Block–based coding should be improved:

- motion compensation
- color parameter coding

Appropriate coding mode for a object depends on object size

Size of moving object $\gtrless$ 256 pels

OBASC

Hybrid coding