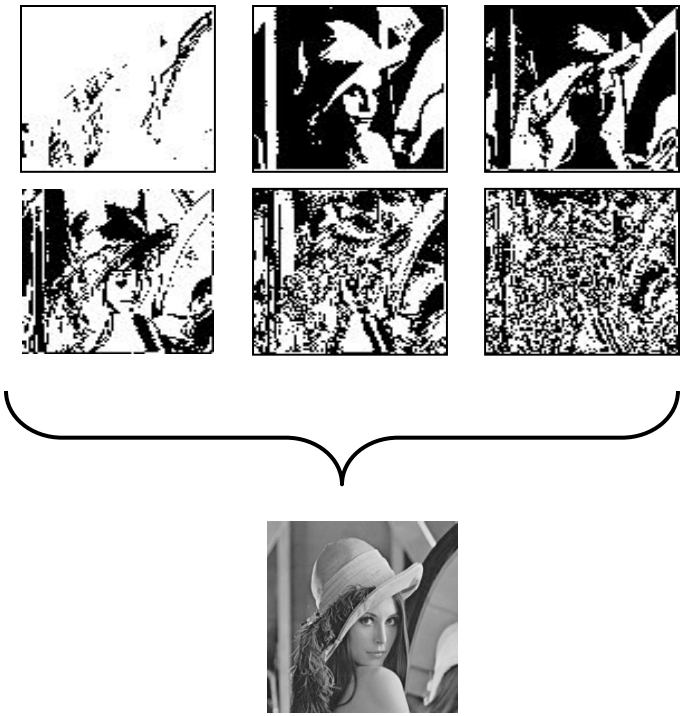
Video Compression



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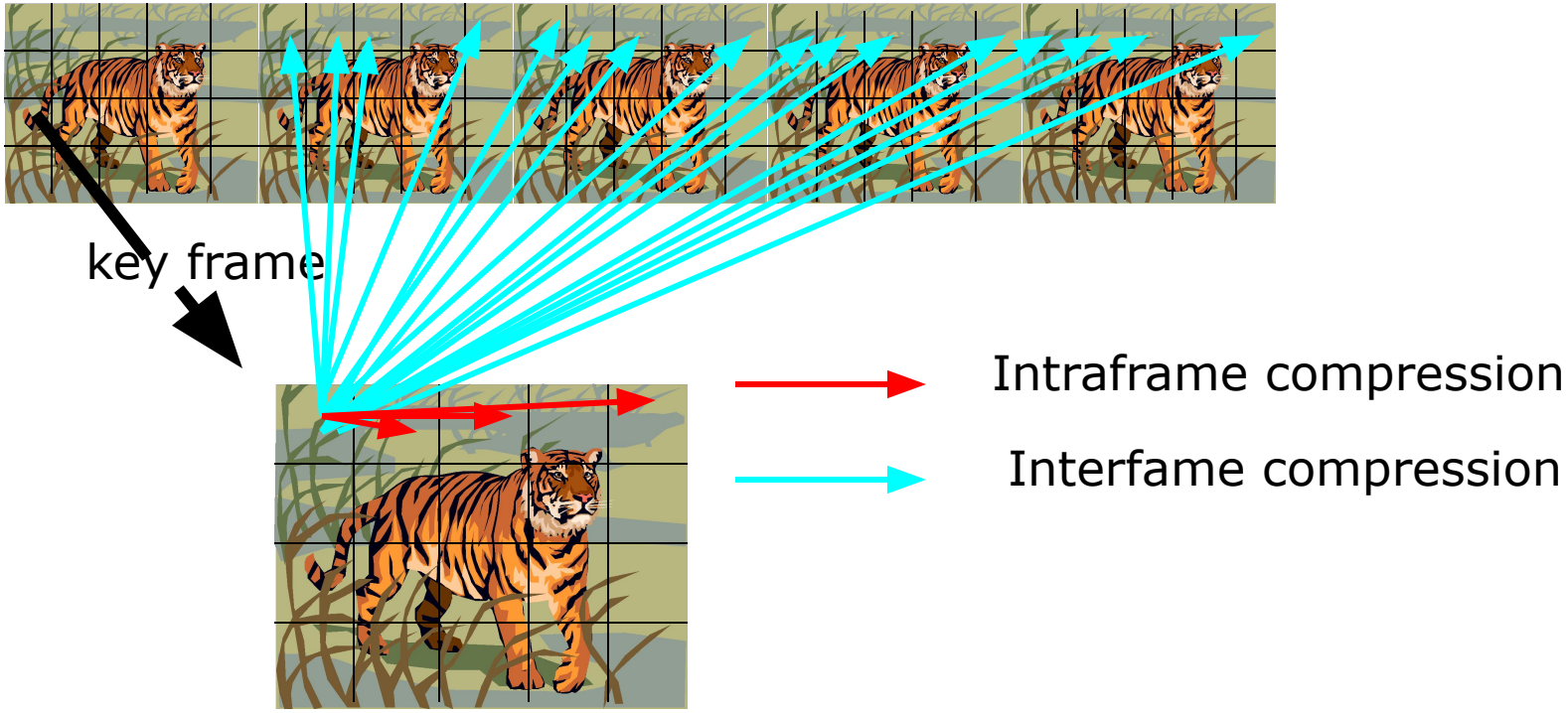
Preface

The main differences between this method and methods, which are used, is the usage of both compressions, such as interframe compression and intraframe compression. Video stream represents such as single multicopy image.

Thus the main purpose will be conclude in finding of optimal number of frames in whole stream? Where compression or quality will be the best. And compression will be come inside this chain of frames.

Physical representation



• Formal problem statement

- According to key frame frequency results in compression F and in quality Q will be different. The main purpose will be definition of the optimal values for foregoing F and Q.
- Y- key frame ratio
- F- compression ratio
- a_1- intraframe compression ratio parameter
- a_2-interframe compression ratio parameter
- Q – quality
- B_1-intraframe quality parameter
- B_2 –interframe quality parameter

$$\begin{cases} F = \sum_{y \geq 1} a_i y^i \\ Q = \sum_{y \geq 1} b_i / y^i \end{cases}$$

Optimal key frame frequency. (Q- const)

• Formal problem statement:

$$\begin{cases} F = a_1 + a_2 y \to \max \\ b_1 + b_2 / y \ge Q_{const}; \\ y \ge 1 \end{cases}$$

•Problem-solving

$$L_1 = a_1 + a_2 y + \lambda\left[Q_{const} - b_1 - b_2 / y\right]; \quad \frac{\partial L_1}{\partial y} = 0 \quad \frac{\partial L_1}{\partial \lambda} = 0 \quad \Rightarrow \quad y_{optimal} = \frac{Q_{const} - b_1}{b_2}$$

•**optimal key frame frequency** $y_{optimal} = \max\{1; \ \frac{Q_{const} - b_0}{b_1}\}.$

Optimal key frame frequency. (F- const)

• Formal problem statement:

$$\begin{cases} Q = b_1 + \dfrac{b_2}{y} \to \max; \\ a_1 + a_2 y \geq F_{const} \\ y \geq 1 \end{cases}$$

•Problem-solving

$$L_2 = b_1 + \frac{b_2}{y} + \lambda\left[F_{const} - a_1 - a_2 y\right]; \quad \frac{\partial L_2}{\partial y} = 0 \quad \frac{\partial L_2}{\partial \lambda} = 0 \quad \Rightarrow \quad y_{optimal} = \frac{F_{const} - a_1}{a_2}$$

•optimal key frame frequency

$$y_{optimal} = \max\{1, \frac{F_{const} - a_1}{a_1}\}.$$