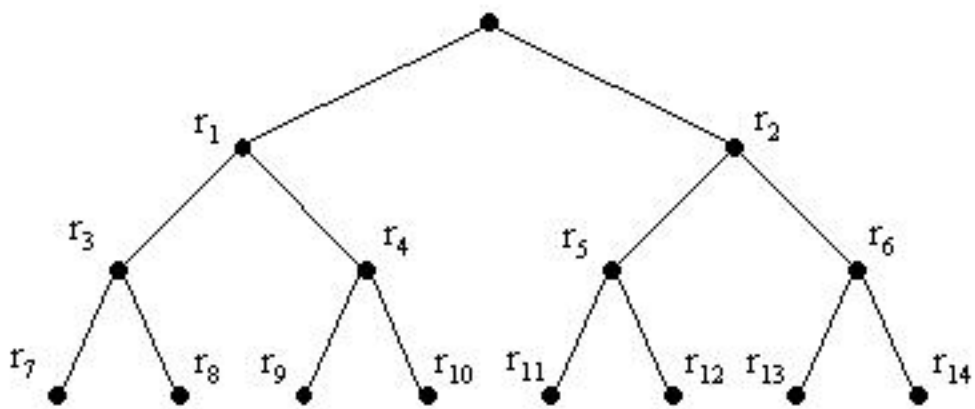
Vector Quantization

- K-means complexity:
  - M = number of training vectors
  - L = number of codewords
  - N = dimension of vectors
- With a <u>full search</u> algorithm:
  - Complexity of codebook design:
    - MNL adds and mults per iteration
    - (M+L)N storage
  - Complexity of the transmitter
    - NL adds and mults per vector
    - NL storage

Tree Codebooks

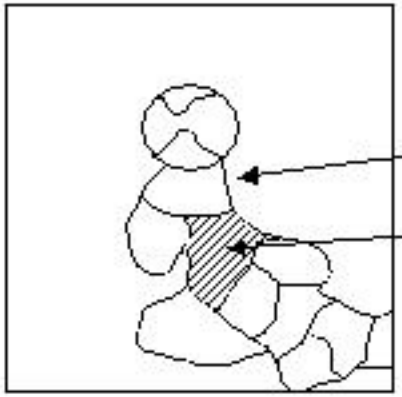
- L = number of codewords = 2^p
  - 1. Use "k-means" to divide N dimensional span into 2 regions (L = 2 in "old" algorithm).
  - 2. Divide each of these 2 regions into 2 more regions using k-means.
  - 3. Repeat step 2 until there are L reconstruction levels



Complexity of Tree Codebook

- Codebook design
  - $2NM \log_2 L$ operations
  - Storage is the same as for full search
- Operation complexity at transmitter
  - $2N \log_2 L$ operations per vector
  - Twice as much storage as full search

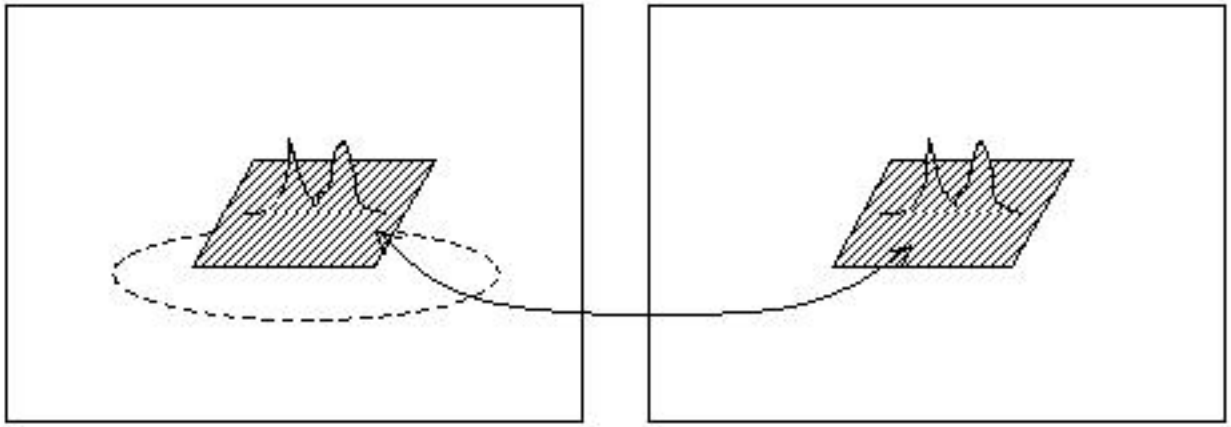
Second Generation Image Coding



- Code:
  - edges
  - textures

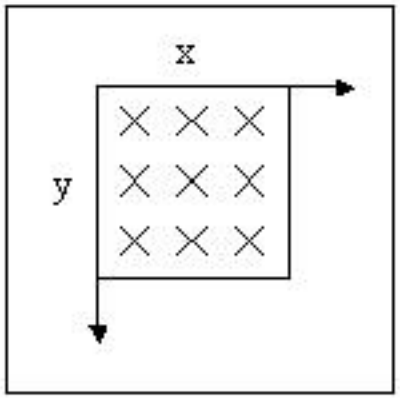
Arbitrary Shape Coding

- Useful for editing → extracting objects and backgrounds



Video Coding

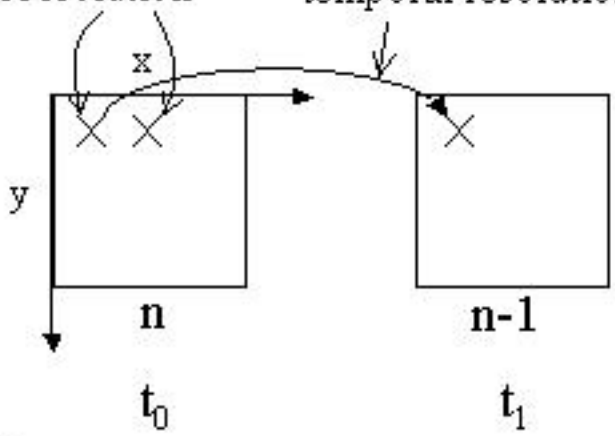
- Want to take advantage of spatial and temporal redundancy.

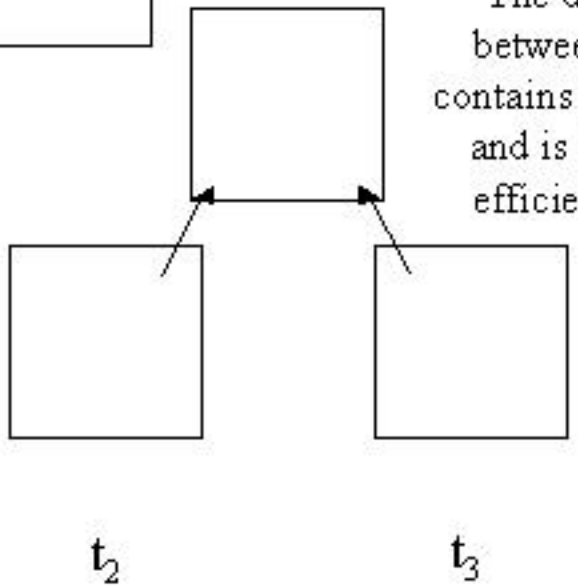


Taking advantage of:

spatial resolution

temporal resolution





The difference between images contains less energy, and is thus more efficient to code