
CHAPTER 15

Data Compression

(Solutions to Odd-Numbered Problems)

Review Questions

1. The two categories of data compression methods are lossless and lossy.
3. Run length encoding is a lossless compression method in which repeated occurrences of a symbol are replaced by one occurrence of the symbol followed by the number of occurrences.
5. Huffman coding uses the frequency of the characters in the file to construct a tree. The tree is then used to generate codes for each character with the more frequent characters having shorter codes than the less frequent characters.
7. In Huffman coding, both the sender and receiver must have a copy of the same code in order for the decoded file to match the encoded file. In LZ encoding, the dictionary is generated from the data itself.
9. JPEG is used to compress images while MPEG is used to compress video.
11. Blocking is the act of dividing the image into 8×8 blocks in order to reduce the number of calculations.
13. Quantization of the T table reduces the number of bits needed for encoding each value.
15. Spatial compression is the compression of each frame by using a modified version of JPEG; temporal compression is the removal of redundant frames in MPEG.

Multiple-Choice Questions

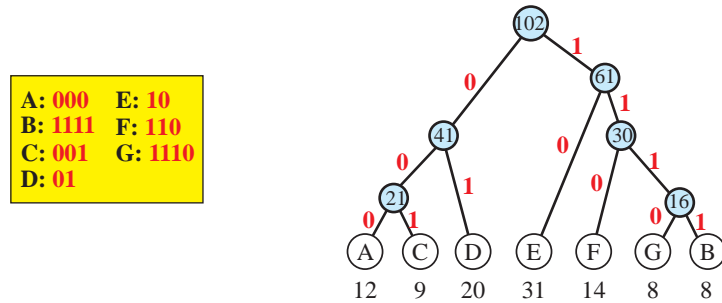
17. b 19. d 21. d 23. a 25. c 27. b
29. c

Exercises

31. 10010 00000 11111 11001 01111 00000 00000

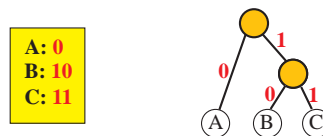
33. Different codes result from different ways of organizing the tree. One possible tree with the resulting code is shown Figure S15.33.

Figure S15.33 Exercise 33



35. This can be a Huffman code. The shorter code is not the prefix of any of the two longer codes. The tree is shown in Figure S15.35.

Figure S15.35



37. 100 0101 0101 000 1100

39. Encoding is shown in Figure 15.39a. Decoding is shown in Figure 15.39b.

Figure S15.39a Exercise 39 part a

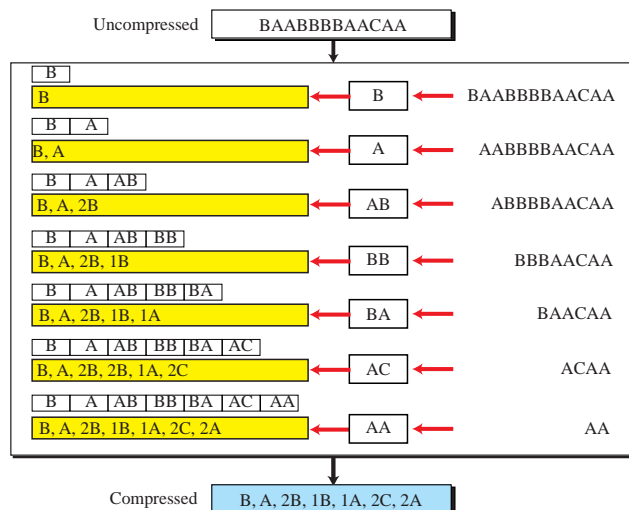
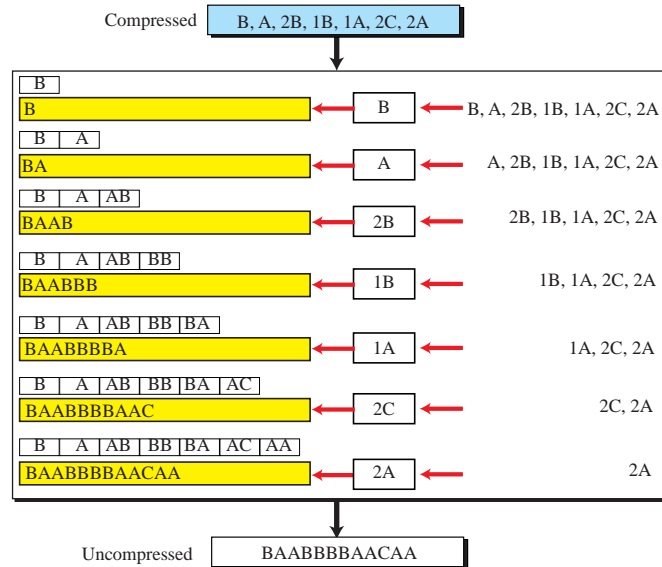


Figure S15.39b Exercise 39 part b



41. Calculations are

$$\begin{aligned}
 T(0, 0) &= 1/16 [16 + 32 + 128 + 48] &= 17.00 \\
 T(0, 1) &= 1/16 [0.94 (64) + 0.90 (32) + 0.85 (128) + 0.80 (48)] &= 14.08 \\
 T(1, 0) &= 1/16 [0.90 (64) + 0.85 (32) + 0.80 (128) + 0.75 (48)] &= 13.59 \\
 T(1, 1) &= 1/16 [0.85 (64) + 0.80 (32) + 0.75 (128) + 0.70 (48)] &= 13.10
 \end{aligned}$$