			٠	_							C					
10						Q.	01			Ç	00					
	<u>-1</u>	110	110	101	101	100	100	011	011	010	2	001	901	000	000	
1111	1110	1101	1100	1011	1010	1001	1000	0111	0110	0101	0100	0011	0010	0001	0000	

The total symbol code budget

available when making a uniquely

indicated by the size of the box it

Figure 5.1. The symbol coding budget. The 'cost' 2^{-l} of each codeword (with length l) is

is written in. The total budget

You can think of this diagram as showing a codeword supermarket, with the codewords arranged in aisles by their length, and the cost of each codeword indicated by the size of its box on the shelf. If the cost of the codewords that you take exceeds the budget then your code will not be uniquely decodeable.

	C_0 :
- 0	a_i
11 10 01 00	a_i $c(a_i)$ l_i a 1000 4 b 0100 4 c 0010 4 d 0001 4
C ₀	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
1 1110 0 11001 1010 1000 10000	d c b a a_i
- 0	$c(a_i)$ 0 10 110 111
10 01 80	C_3 :
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
00000 00000 00000 00000 00000 00000 0000	$egin{array}{c} l_i \ 1 \ 2 \ 3 \ 3 \ 3 \ \end{array}$
	C_4 C_5 a 00 0 b 01 1 c 10 00 d 11 11
111 1110 11110 11110 11110 11110 1110	
- 0	C_6 : a_i $c(a_i)$ p_i $h(p_i)$ l_i a 0 $1/2$ 1.0 1 b 01 $1/4$ 2.0 2 c 011 $1/8$ 3.0 3 d 111 $1/8$ 3.0 3
	C_6 : p_i p_i $1/2$ $1/4$ $1/8$ $1/8$
111 101 100 010 000 000	$h(p_i) \ 1.0 \ 2.0 \ 3.0 \ 3.0$
1111 1110 1100 1100 1100 1000 1000 100	$egin{array}{c c} l_i \ \hline 2 \ 3 \ \hline 3 \ \hline \end{array}$

I				
a_i	p_i	$\log_2 \frac{1}{p_i}$	l_i	$c(a_i)$
മ	0.0575	4.1	4	0000
Ъ	0.0128	6.3	6	001000
C	0.0263	_	೮	00101
Д	0.0285	5.1	೮	10000
Ф	0.0913	3.5	4	1100
Ħ	0.0173	5.9	6	111000
ଫ	0.0133	6.2	6	001001
ਖ	0.0313	5.0	೮	10001
р.	0.0599	4.1	4	1001
ت.	0.0006	10.7	10	1101000000
ᅜ	0.0084	6.9	7	1010000
_	0.0335	4.9	೮٦	11101
Ħ	0.0235	5.4	6	110101
Ħ	0.0596	4.1	4	0001
0	0.0689	3.9	4	1011
р	0.0192	5.7	6	111001
Д	0.0008	10.3	9	110100001
r	0.0508	4.3	೮	11011
Ø	0.0567	4.1	4	0011
ct	0.0706	3.8	4	1111
u	0.0334	4.9	တ	10101
⋖	0.0069	7.2	∞	11010001
W	0.0119	6.4	7	1101001
×	0.0073	7.1	7	1010001
У	0.0164	5.9	6	101001
N	0.0007	10.4	10	1101000001
ı	0.1928	2.4	2	01

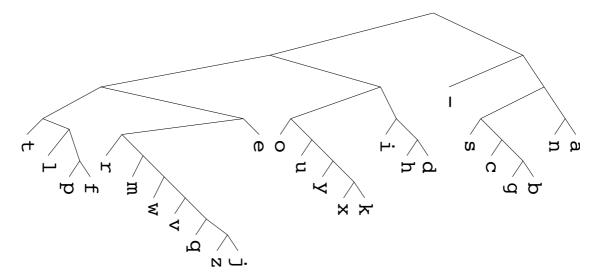


Figure 5.6. Huffman code for the English language ensemble (monogram statistics).

codelengths and the ideal codelengths $\log_2 1/p_i$. the ensemble is 4.11 bits. Observe the disparities between the assigned ure 5.6. This code has an expected length of 4.15 bits; the entropy of