Extension	Efficiency
1	0.6098
2	0.8544
3	0.9663
4	0.9837
5	0.9926

Table 1. Efficiencies of {0.85, 0.15} Huffman code extensions

Extension	Efficiency
1	0.7219
2	0.9255
3	0.9917
4	0.9745
5	0.9783

Table 2. Efficiencies of {0.80, 0.20} Huffman code extensions

Ext =	1	2	3	4	5	6	7
0.05	0.2864	0.4992	0.6610	0.7800	0.8519	0.9056	0.9429
0.10	0.4690	0.7271	0.8805	0.9522	0.9767	0.9975	0.9887
0.15	0.6098	0.8544	0.9663	0.9837	0.9926	0.9817	0.9914
0.20	0.7219	0.9255	0.9917	0.9745	0.9783	0.9954	0.9866
0.25	0.8113	0.9615	0.9859	0.9913	0.9921	0.9910	0.9932
0.30	0.8813	0.9738	0.9699	0.9882	0.9913	0.9922	0.9964
0.35	0.9341	0.9692	0.9840	0.9836	0.9963	0.9896	0.9963
0.40	0.9710	0.9710	0.9894	0.9896	0.9931	0.9945	0.9955
0.45	0.9928	0.9928	0.9928	0.9929	0.9946	0.9951	0.9959

Table 3. Efficiencies for extensions of a range of binary codes

```
  □ =  0.0       0.1       0.2       0.3       0.4       0.5
Ext = 1 |.........:.........:.........:.........:.........:
      2 |.........:.........:.........:.........:.........:
      3 |.........:.........:.........663.......:.........:
      4 |.........:.......688886......:...134554:.........:
      5 |.........:.........:.........:.........:.........:
      6 |.........:..1777...:....43...:57777651.:.........:
      7 |........57887.....677652.....:.........:.........:
      8 |.......3666....455432........5666654...:.........:
      9 |.........:.........:.........:.........:43.......:
```

Table 4. Efficiency losses for extensions of a range of binary codes

P(A) = 0.35; P(B) = 0.65			Length for P(A) = □	P(A) = 0.45; P(B) = 0.55	
BB	0.4225	0	(1□□)^2	0.3025	11
BA	0.2275	10	2 □ (1□□) □	0.2475	10
AB	0.2275	111	3 □ □ (1□□)	0.2475	01
AA	0.1225	110	3 □ □^{2}	0.2025	00

Table 5.Huffman codes for probabilities of 0.35 and 0.45

Probability range	codeword lengths	Average codeword lengths
0.00 < □ < 0.30	{4, 4, 4, 4, 3, 3, 3, 1}	L = □2 □^{3} + 6 □ + 1
0.30 < □ < 0.34	{4, 4, 4, 4, 3, 3, 2, 2}	L = □2 □^{3} + 2 □^{2} + 2 □ + 2
0.34 < □ < 0.44	{4, 4, 3, 3, 3, 3, 3, 2}	L = □^{3} □ 2 □^{2} + 3 □ + 2
0.44 < □ < 0.50	{3, 3, 3, 3, 3, 3, 3, 3}	L = 3

Table 6. Code trees and word lengths for third extension

```
                              P(A)
                  0.1       0.2       0.3       0.4       0.5
          ----:----|----:----|----:----|----:----|----:----|
     0.01 ·····························44··············4444
     0.02  ··························44············4444444
     0.03   ·····················44444············4444444
     0.04    ··················4444444···········4444444
     0.05     ···············4444444444··········444444
     0.06      ············4444444444444·······4444444
     0.07       ··········444444444444444······444444
     0.08        ·········44444444444444············
     0.09         ········4444444444444············
     0.10          ·······444444444444············
     0.11           ······4444444444·············
     0.12            ······44444444·············
P(B) 0.13             ······44444··33··········
     0.14              ······44·333333········
     0.15               ······33333333·······
     0.16                ···3333333333······
     0.17                 333333333333344··
     0.18                  3333333333334··
     0.19                   33333333333··
     0.20                    3333333333·
     0.21                     333333333
     0.22                      3333333
     0.23                       33333
     0.24                        33·
     0.25                         ·
```

Table 7. Anomalies for ternary Huffman codes

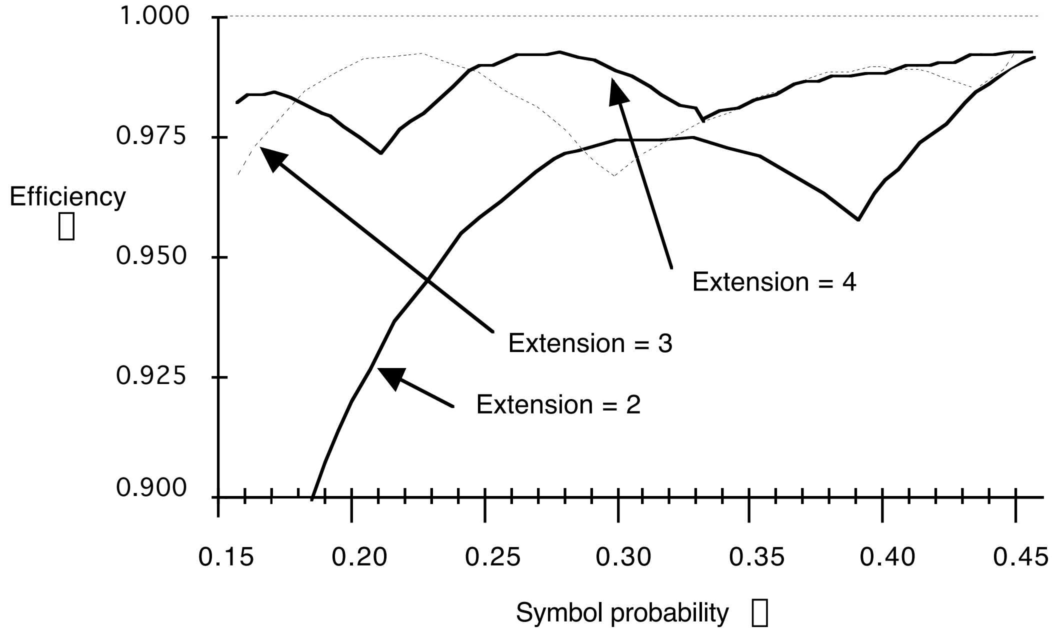

Figure 1. Huffman code efficiency; extension as parameter

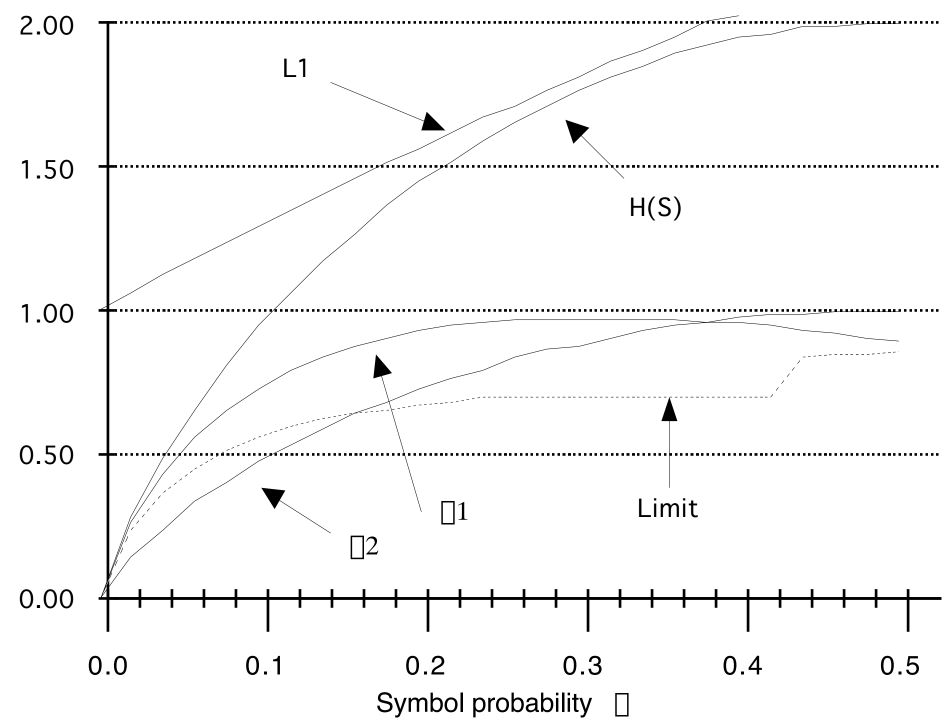

Figure 2.
Details of efficiency , second extension of binary code