Cmput 313

Assignment 1

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The simulation performed has been used to determine the impact that error-correction encoding has on the throughput of a communication channel. In our simulations, the value of K range from 0 to 5, for each value of e ranging from 0.0001 to 0.0020, all other variables remaining constant(A = 500, K = 0-5, F = 6000, e = 0.0001 to 0.0020, R = 600000, T = 5 (1, 2, 3, 4, 5))

At a value of K=0, no error-correction encoding is used. As K increases, a larger number of check bits are required to transmit each frame, however, more bad bits can be tolerated before having to retransmit the frame.

In our testing we found the optimal value of K to be to be K = 5 at a value of e = 0.0001. As the Value of e increases, the throughput decreases, as the rate of bad bits (and therefore bad frames) increases.

e	Throughput(lower, upper)	e	Troughput(lower, upper)
K = 0		K= 3	
0.0001	.67 (.34, 1.0)	0.0001	2.14 (1.81, 2.47)
0.0005	.07 (.01, .13)	0.0005	.69, (-.01, 1.39)
0.001	0(0, 0)	0.001	.11 (.06, .16)
0.0015	0(0, 0)	0.0015	.03 (0, .05)
0.002	0(0, 0)	0.002	0(0, 0)
K =1		K = 4	
0.0001	.73 (.48, .98)	0.0001	2.97 (2.97, 2.97)
0.0005	.16 (.07, .25)	0.0005	1.83 (.25, 3.42)
0.001	.02 (.01, .03)	0.001	.27 (.01, .54)
0.0015	0(0, 0)	0.0015	0.03 (0, 0.06)
0.002	0(0, 0)	0.002	0(0, 0)
K = 2		K = 5	
0.0001	1.53 (1.29, 1.76)	0.0001	3.5 (3.5, 3.5)
0.0005	.42 (-.18, 1.02)	0.0005	2.21 (.43, 4.0)
0.001	0.08 (.05, .1)	0.001	.63 (-.91, 2.18)
0.0015	.02 (.01, .02)	0.0015	.05 (0.03, 0.08)
0.002	0(0, 0)	0.002	0(0, 0)

The trend within the values of K is consistent with what is to be expected, but the trend between K's is not. The expectation is that the throughput should be between the values of 0 and 1, meaning there is an bug within our code that was not resolved in time. Second, the expectation is that eventually, as the value of K increases, the number of total bits transmitted increases, resulting in more error bit padding and therefore more chances for errors. This is not seen within the data either, and not for a lack of small sample size; K values as high as 100 were attempted, but the trend holds, which again points to a bug in our final code. Were we able to successfully implement our code, we would expect that when K = 0, the lack of error checking would quickly reduce the throughput as the error rate increased. As K increased, we expected that the initial throughput values would be improved over the baseline of K = 0; any overhead incurred as a result of the additional error checking bits would be greatly overshadowed by the benefits gained by having better error detection, especially when the error rates and the values of K remained small. We also expected that once a threshold value of K and e was reached, the Hamming Single Bit Correction scheme would not be capable of handling the larger amounts of bits required when dividing up a frame into more blocks, and hence more check bits.

In the case of greatly increasing the acknowledgement time, the rate of correctly transmitted bits would stay the same, but assuming the R remains static, then the total number of correctly received frames would drop, while the final R would remain the same (although with a larger portion of it being made of of ACK time). As a result, we would expect it to drop very quickly.