

Index

- algorithm
 - BCJR, 210, 218, 234
 - Berlekamp-Massey, 128
 - Chien search, 111, 126
 - direct solution (of syndrome equations), 146
 - Euclidean, 108, 122, 125
 - soft output Viterbi algorithm (SOVA), 210
 - sum-product (belief propagation), 281, 282
 - Viterbi (VA), 182, 231
- ARQ, 41, 68, 80, 317
 - go back N, 70
 - hybrid, 72
 - selective repeat, 70
 - stop and wait, 69
- balanced incomplete block design, 281
- bandwidth, 5, 27, 40, 336
- bit, 1, 4
- bit rate, 71
- block length, 50
- byte, 139
- channel, 1, 10
 - additive white Gaussian noise (AWGN), 28, 40, 181, 213, 330
 - binary/non-binary erasure, 12, 39, 315, 317, 319
 - binary symmetric, 1, 11, 39, 188
 - capacity, 1, 21, 24, 31, 39
 - characteristics, 138, 213, 215
 - coding theorem, 2, 6, 25
 - delay, 71
 - discrete, 1, 30, 215, 218
 - feedback, 12, 65
 - memoryless, 191, 215, 218
 - non-symmetric, 39, 40
 - soft-decision (quantised), 194, 273
 - stationary, 216
- code
 - array, 272
 - Bose, Chaudhuri, Hocquenghem (BCH), 97, 104
 - block, 41, 43, 50, 77
 - construction (of LDPC), 249
 - cyclic, 81, 86, 97, 115, 272, 281
 - cyclic redundancy check (CRC), 92, 317
 - concatenated, 140, 154, 253, 271
 - convolutional, 157
 - efficiency, 71
 - extended RS, 154
 - fountain, 317, 318
 - Gallager, 277
 - Hamming, 64, 89, 98, 99, 100
 - linear, 50, 157
 - low density parity check (LDPC), 277
 - linear random, 318
 - Luby transform (LT), 317, 320
 - minimum distance separable (MDS), 118
 - multiple turbo code (MTC), 253
 - non-binary/q-ary, 115, 317
 - non-linear, 94
 - non-systematic, 175

- code (*Continued*)
 - packet/frame, 68, 71, 92, 317, 318
 - perfect, 65
 - product, 272
 - punctured, 200, 209, 272
 - quasi-cyclic, 139, 281
 - rate, 43
 - rate compatible, 200, 203
 - regular/irregular LDPC, 280
 - repetition, 42, 77
 - Reed-Solomon (RS), 115, 136, 200
 - segment (of sequence), 157
 - sequence (of convolutional code), 161, 163, 165
 - shortened, 139, 154
 - single (simple) parity check (SPC), 88, 272, 310
 - structured/random LDPC, 280
 - systematic, 52, 119, 168, 278
 - turbo, 201, 209
 - variable length, 2
 - vector, 50
 - word, 2, 41, 50
- concatenation, 140, 253
 - parallel, 209, 254
 - serial, 149, 200, 254
- constraint length, 160, 184, 206
- decoder
 - algebraic, 104, 125, 128
 - complexity, 147, 201, 202, 234, 254, 257, 277, 281, 297, 302, 306, 322
 - decoding (search) length, 184, 194
 - delay, 251
 - erasure, 149, 320
 - error trapping, 92
 - forward/backward recursion, 222, 237
 - hard-decision, 67, 189
 - inverse transfer function, 169
 - iterative, 130, 209, 221, 239, 282, 310
 - log-MAP, 210
 - log sum-product, 302
 - maximum *a posteriori probability* (MAP), 210, 214, 217
 - maximum likelihood (ML), 182, 192, 217
 - Meggitt, 91, 113
 - simplified sum-product, 297
 - soft-decision, 189, 194, 208
 - soft input, soft output, 209
 - spectral domain, 145
 - symbol/parity-check node, 308, 312, 314, 315
 - syndrome, 55, 89, 104, 120
 - turbo, 211, 239
- delay (transform) domain (D-domain), 158, 161, 172
 - D-domain sequence, 173
- detection
 - MAP, 214
 - matched filter, 12
 - ML, 181, 214
 - soft-decision, 213
 - symbol, 213
- dimension
 - of block code 50
 - of vector space/sub-space, 47
- distance, 32, 58, 177
 - BCH bound, 102, 113
 - cumulative, 182, 197
 - definition, 32, 58, 178
 - designed, 103
 - Euclidean, 189
 - Free/minimum free, 178, 180, 274
 - Hamming, 58, 182, 189
 - minimum, 58
 - soft, 193
 - squared Euclidean, 197
- encoder
 - block, 50
 - catastrophic, 170, 205
 - channel, 3
 - connections, 160, 166, 281
 - convolutional, 158
 - memory, 159
 - non-systematic, 175
 - random, 33
 - recursive systematic, 209, 240
 - register length, 161
 - representations, 166
 - row/column, 273
 - shortest state sequence, 174, 176

- source, 3
- state diagram, 166, 178, 185
- systematic, 52, 85, 159, 168, 176
- tree diagram, 168
- trellis diagram, 168, 176, 197, 202, 218
- turbo, 210
- entropy, 4, 5, 6, 8
 - a posteriori*, 15
 - a priori*, 15
 - conditional, 10
 - forward/backward, 14
 - mutual, 16, 20
 - noise (error), 18, 20
 - output (sink), 18
 - source, 5, 8, 38
- erasure, 12, 77, 149, 317
- equivocation, 17, 39
- error
 - bit error rate (BER), 329, 332
 - burst, 91, 137, 159, 200, 249
 - correction, 41, 43, 59
 - detection, 41, 42, 55, 89
 - event, 55
 - floor, 253, 255
 - pattern, 56, 91
 - probability, 1, 61, 66, 68, 186
 - random, 42, 62
 - rate, 2, 66, 195
 - undetected, 56, 68, 91, 181
- EXIT chart
 - for turbo codes, 257, 259
 - for LDPC codes, 306, 312, 314, 315
- finite field
 - binary, 32, 45, 341
 - conjugate element, 100, 347
 - construction, 344
 - extended, 97, 339
 - Galois, 45, 339
 - geometry, 281
 - primitive element, 100, 342
- finite state sequential machine (FSSM), 158
 - impulse response sequence, 159
 - finite impulse response (FIR), 170, 206
 - generating function, 179, 207
 - infinite impulse response (IIR), 175, 208
 - transfer function, 172
- forward error control/correction, 42, 65, 79, 184, 318
- Gaussian elimination, 89
- graph
 - bipartite/Tanner, 279, 281, 287, 320
 - cycles, 282, 297, 324
 - parity-check node, 283
 - symbol node, 283
- group, 339
- information
 - a priori*, 209, 237, 239
 - average, 4
 - extrinsic, 209, 237
 - measure, 1, 3
 - mutual/transinformation, 10, 16, 39, 265, 312
 - rate, 4, 5
 - self, 38
- inner product, 48, 51
- interleaving, 137, 148, 253
 - block, 243, 25, 243, 275
 - convolutional, 154, 249, 250
 - in compact disc, 138
 - linear, 253
 - of connections, 308
 - permutation, 253, 273
 - random/pseudo-random, 209, 249, 251, 274
- intersymbol interference (ISI), 328, 330
- key equation, 107, 123, 125
- L'Hopital's rule, 5
- linear dependence/independence, 47
- log likelihood ratio (LLR), 214
- low pass filter, 330
- Mason's rule, 179
- matrix
 - generator, 48, 51, 53, 87, 162, 278, 319
 - parity-check, 54, 58, 278
 - puncturing, 201

- matrix (*Continued*)
 - row operation, 48, 87
 - row space, 48
 - state transfer function, 172, 176
 - transfer function, 158, 162, 170, 176
 - transition probability, 39
- message, 2, 3, 43
- modulo-2 addition/multiplication, 45, 82, 340

- Newton identities, 130
- Nyquist, 5, 30, 34

- octal notation, 240

- parity-check, 43, 52
 - equations, 53, 57
- performance of coding, 23, 32, 34, 59, 65, 67, 68, 77, 152, 200, 203, 234, 257, 269, 277, 279, 281, 282, 297, 322
 - coding gain, 79, 195
 - error floor, 253, 255
 - EXIT chart, 257, 306
 - soft-decision bound, 194
 - waterfall region, 253, 255, 264, 269
 - union bound, 187
- polynomial, 339, 342
 - code, 83, 100, 161
 - error evaluation, 106, 122
 - error location, 106, 122, 129
 - generator, 83, 94, 112, 115
 - irreducible, 100, 112, 343
 - message, 85
 - minimal, 97, 99, 112, 348
 - monic, 81
 - parity-check, 88, 94
 - primitive, 97, 112, 343
 - remainder, 85
 - roots, 97, 101, 343
 - syndrome, 90, 123
- power spectral density, 30, 65
- probability
 - a posteriori*, 15, 219, 234, 281
 - a priori*, 15, 209
 - backward, 14
 - Bayes' rule, 13, 192, 212, 235, 283
 - binomial distribution, 42
 - channel, 13
 - conditional, 10
 - conditional distribution, 213
 - density function, 24, 193, 212, 330
 - distribution function, 212
 - erasure, 12
 - error, 1
 - forward/transitional, 14, 39, 216
 - joint, 14
 - log likelihood ratio (LLR), 214, 234, 310
 - marginal distribution, 216
 - measure/metric, 212
 - node error, 188
 - output/sink, 13, 19
 - source, 5, 38
- Q-function, 66, 333

- retransmission error control/correction, 12, 41, 68, 80, 317

- sampling, 5, 27, 30, 137, 189, 213, 329
- sequence, 157
 - data, 327
 - generating function, 179, 185
 - generator, 160
 - survivor, 183
- Shannon, 1, 2, 3, 10, 22, 34
 - limit, 36, 37, 209, 277, 322
 - theorems, 22, 25, 317
- signal
 - average energy, 65, 335
 - digital, 327
 - M-ary, 40
 - non-return-to-zero (NRZ), 334
 - polar, 67, 190, 196, 214, 328, 334
 - pulse, 327
 - pulse amplitude modulated, 327
 - space, 27
 - to-noise ratio, 35, 40, 65, 234, 335
 - unipolar, 327, 334
 - vector, 27, 28
- sink, 3, 19

- source, 1, 5
 - binary, 1
 - coding theorem, 22
 - compression, 2
 - discrete memoryless, 38
 - efficiency, 38
 - entropy, 5, 8, 38
 - extended, 9
 - information, 1, 6
 - information rate, 5, 6, 65
 - Markov, 215
- standard array, 61
- Stirling's approximation, 24, 35
- symbol, 3, 12, 213, 329
- syndrome, 55, 61, 89
 - equations, 97, 124, 129, 146
 - vector, 55
- systems
 - communications, 3, 31, 34, 42, 65, 68, 92, 200
 - compact disc (CD), 12, 136
 - data networks/internet, 12, 92, 317
 - duplex, 41, 317
- trellis, 168, 192, 217, 223
- Vandermonde determinant, 102, 117
- vector
 - basis, 48
 - dual subspace, 48, 49
 - space, 44, 189
 - subspace, 46, 157
- weight, 58

