Breadth First Search:

verices=275, edges=641
start=(1,1), goal=(20,20), vertices: 0 and 274
iter=1, frontier=0, popped=0 (1,1), dist2goal= 26.9
pushed 1 (1,2)
pushed 20 (2,1)
pushed 21 (2,2)
iter=2, frontier=2, popped=1 (1,2), dist2goal= 26.2
pushed 2 (1,3)
pushed 22 (2,3)
iter=3, frontier=3, popped=20 (2,1), dist2goal= 26.2
pushed 40 (3,1)
pushed 41 (3,2)
iter=4, frontier=4, popped=21 (2,2), dist2goal= 25.5
pushed 42 (3,3)
iter=5, frontier=4, popped=2 (1,3), dist2goal= 25.5
pushed 3 (1,4)
pushed 23 (2,4)
iter=6, frontier=5, popped=22 (2,3), dist2goal= 24.8
pushed 43 (3,4)
iter=7, frontier=5, popped=40 (3,1), dist2goal= 25.5
pushed 59 (4,1)
pushed 60 (4,2)
iter=8, frontier=6, popped=41 (3,2), dist2goal= 24.8
pushed 61 (4,3)
iter=9, frontier=6, popped=42 (3,3), dist2goal= 24.0
pushed 62 (4,4)
iter=10, frontier=6, popped=3 (1,4), dist2goal= 24.8
pushed 4 (1,5)
pushed 24 (2,5)
iter=11, frontier=7, popped=23 (2,4), dist2goal= 24.1
pushed 44 (3,5)
iter=12, frontier=7, popped=43 (3,4), dist2goal= 23.3
pushed 63 (4,5)
iter=13, frontier=7, popped=59 (4,1), dist2goal= 24.8
pushed 75 (5,1)
pushed 76 (5,2)
iter=14, frontier=8, popped=60 (4,2), dist2goal= 24.1
pushed 77 (5,3)
iter=15, frontier=8, popped=61 (4,3), dist2goal= 23.3
iter=16, frontier=7, popped=62 (4,4), dist2goal= 22.6
iter=17, frontier=6, popped=4 (1,5), dist2goal= 24.2
pushed 5 (1,6)
pushed 25 (2,6)
iter=18, frontier=7, popped=24 (2,5), dist2goal= 23.4
pushed 45 (3,6)

iter=19, frontier=7, popped=44 (3,5), dist2goal= 22.7
pushed 64 (4,6)
iter=20, frontier=7, popped=63 (4,5), dist2goal= 21.9
iter=21, frontier=6, popped=75 (5,1), dist2goal= 24.2
pushed 87 (6,1)
pushed 88 (6,2)
iter=22, frontier=7, popped=76 (5,2), dist2goal= 23.4
pushed 89 (6,3)
iter=23, frontier=7, popped=77 (5,3), dist2goal= 22.7
iter=24, frontier=6, popped=5 (1,6), dist2goal= 23.6
pushed 6 (1,7)
pushed 26 (2,7)
iter=25, frontier=7, popped=25 (2,6), dist2goal= 22.8
pushed 46 (3,7)
iter=26, frontier=7, popped=45 (3,6), dist2goal= 22.0
pushed 65 (4,7)
iter=27, frontier=7, popped=64 (4,6), dist2goal= 21.3
iter=28, frontier=6, popped=87 (6,1), dist2goal= 23.6
pushed 99 (7,1)
pushed 100 (7,2)
iter=29, frontier=7, popped=88 (6,2), dist2goal= 22.8
pushed 101 (7,3)
iter=30, frontier=7, popped=89 (6,3), dist2goal= 22.0
iter=31, frontier=6, popped=6 (1,7), dist2goal= 23.0
pushed 7 (1,8)
pushed 27 (2,8)
iter=32, frontier=7, popped=26 (2,7), dist2goal= 22.2
pushed 47 (3,8)
iter=33, frontier=7, popped=46 (3,7), dist2goal= 21.4
pushed 66 (4,8)
iter=34, frontier=7, popped=65 (4,7), dist2goal= 20.6
iter=35, frontier=6, popped=99 (7,1), dist2goal= 23.0
pushed 113 (8,1)
pushed 114 (8,2)
iter=36, frontier=7, popped=100 (7,2), dist2goal= 22.2
pushed 115 (8,3)
iter=37, frontier=7, popped=101 (7,3), dist2goal= 21.4
iter=38, frontier=6, popped=7 (1,8), dist2goal= 22.5
pushed 8 (1,9)
pushed 28 (2,9)
iter=39, frontier=7, popped=27 (2,8), dist2goal= 21.6
pushed 48 (3,9)
iter=40, frontier=7, popped=47 (3,8), dist2goal= 20.8
pushed 67 (4,9)
iter=41, frontier=7, popped=66 (4,8), dist2goal= 20.0
pushed 78 (5,8)
iter=42, frontier=7, popped=113 (8,1), dist2goal= 22.5
pushed 130 (9,1)

pushed 131 (9,2)
iter=43, frontier=8, popped=114 (8,2), dist2goal= 21.6
pushed 132 (9,3)
iter=44, frontier=8, popped=115 (8,3), dist2goal= 20.8
iter=45, frontier=7, popped=8 (1,9), dist2goal= 22.0
pushed 9 (1,10)
pushed 29 (2,10)
iter=46, frontier=8, popped=28 (2,9), dist2goal= 21.1
pushed 49 (3,10)
iter=47, frontier=8, popped=48 (3,9), dist2goal= 20.2
pushed 68 (4,10)
iter=48, frontier=8, popped=67 (4,9), dist2goal= 19.4
iter=49, frontier=7, popped=78 (5,8), dist2goal= 19.2
pushed 90 (6,8)
iter=50, frontier=7, popped=130 (9,1), dist2goal= 22.0
pushed 145 (10,1)
pushed 146 (10,2)
iter=51, frontier=8, popped=131 (9,2), dist2goal= 21.1
pushed 147 (10,3)
iter=52, frontier=8, popped=132 (9,3), dist2goal= 20.2
iter=53, frontier=7, popped=9 (1,10), dist2goal= 21.5
pushed 10 (1,11)
pushed 30 (2,11)
iter=54, frontier=8, popped=29 (2,10), dist2goal= 20.6
pushed 50 (3,11)
iter=55, frontier=8, popped=49 (3,10), dist2goal= 19.7
iter=56, frontier=7, popped=68 (4,10), dist2goal= 18.9
pushed 51 (3,12)
pushed 52 (3,13)
iter=57, frontier=8, popped=90 (6,8), dist2goal= 18.4
pushed 104 (7,8)
iter=58, frontier=8, popped=145 (10,1), dist2goal= 21.5
pushed 150 (11,1)
pushed 151 (11,2)
iter=59, frontier=9, popped=146 (10,2), dist2goal= 20.6
pushed 152 (11,3)
iter=60, frontier=9, popped=147 (10,3), dist2goal= 19.7
iter=61, frontier=8, popped=10 (1,11), dist2goal= 21.0
pushed 11 (1,12)
pushed 31 (2,12)
iter=62, frontier=9, popped=30 (2,11), dist2goal= 20.1
iter=63, frontier=8, popped=50 (3,11), dist2goal= 19.2
iter=64, frontier=7, popped=51 (3,12), dist2goal= 18.8
iter=65, frontier=6, popped=52 (3,13), dist2goal= 18.4
pushed 32 (2,13)
iter=66, frontier=6, popped=104 (7,8), dist2goal= 17.7
pushed 103 (7,7)
pushed 105 (7,9)

pushed 118 (8,8)
pushed 119 (8,9)
iter=67, frontier=9, popped=150 (11,1), dist2goal= 21.0
pushed 155 (12,1)
pushed 156 (12,2)
iter=68, frontier=10, popped=151 (11,2), dist2goal= 20.1
pushed 157 (12,3)
iter=69, frontier=10, popped=152 (11,3), dist2goal= 19.2
iter=70, frontier=9, popped=11 (1,12), dist2goal= 20.6
pushed 12 (1,13)
iter=71, frontier=9, popped=31 (2,12), dist2goal= 19.7
iter=72, frontier=8, popped=32 (2,13), dist2goal= 19.3
pushed 33 (2,14)
iter=73, frontier=8, popped=103 (7,7), dist2goal= 18.4
pushed 102 (7,6)
pushed 117 (8,7)
iter=74, frontier=9, popped=105 (7,9), dist2goal= 17.0
pushed 106 (7,10)
pushed 120 (8,10)
iter=75, frontier=10, popped=118 (8,8), dist2goal= 17.0
pushed 135 (9,8)
pushed 136 (9,9)
iter=76, frontier=11, popped=119 (8,9), dist2goal= 16.3
pushed 137 (9,10)
iter=77, frontier=11, popped=155 (12,1), dist2goal= 20.6
pushed 160 (13,1)
pushed 161 (13,2)
iter=78, frontier=12, popped=156 (12,2), dist2goal= 19.7
pushed 162 (13,3)
iter=79, frontier=12, popped=157 (12,3), dist2goal= 18.8
iter=80, frontier=11, popped=12 (1,13), dist2goal= 20.2
pushed 13 (1,14)
iter=81, frontier=11, popped=33 (2,14), dist2goal= 19.0
pushed 34 (2,15)
pushed 53 (3,15)
iter=82, frontier=12, popped=102 (7,6), dist2goal= 19.1
pushed 116 (8,6)
iter=83, frontier=12, popped=117 (8,7), dist2goal= 17.7
pushed 134 (9,7)
iter=84, frontier=12, popped=106 (7,10), dist2goal= 16.4
pushed 121 (8,11)
pushed 122 (8,12)
iter=85, frontier=13, popped=120 (8,10), dist2goal= 15.6
pushed 138 (9,11)
iter=86, frontier=13, popped=135 (9,8), dist2goal= 16.3
iter=87, frontier=12, popped=136 (9,9), dist2goal= 15.6
iter=88, frontier=11, popped=137 (9,10), dist2goal= 14.9
iter=89, frontier=10, popped=160 (13,1), dist2goal= 20.2

pushed 173 (14,1)
pushed 174 (14,2)
iter=90, frontier=11, popped=161 (13,2), dist2goal= 19.3
pushed 175 (14,3)
iter=91, frontier=11, popped=162 (13,3), dist2goal= 18.4
iter=92, frontier=10, popped=13 (1,14), dist2goal= 19.9
pushed 14 (1,15)
iter=93, frontier=10, popped=34 (2,15), dist2goal= 18.7
pushed 35 (2,16)
pushed 54 (3,16)
iter=94, frontier=11, popped=53 (3,15), dist2goal= 17.7
pushed 69 (4,15)
pushed 70 (4,16)
iter=95, frontier=12, popped=116 (8,6), dist2goal= 18.4
pushed 133 (9,6)
iter=96, frontier=12, popped=134 (9,7), dist2goal= 17.0
iter=97, frontier=11, popped=121 (8,11), dist2goal= 15.0
pushed 139 (9,12)
iter=98, frontier=11, popped=122 (8,12), dist2goal= 14.4
pushed 123 (8,13)
pushed 140 (9,13)
iter=99, frontier=12, popped=138 (9,11), dist2goal= 14.2
iter=100, frontier=11, popped=173 (14,1), dist2goal= 19.9
pushed 185 (15,1)
pushed 186 (15,2)
iter=101, frontier=12, popped=174 (14,2), dist2goal= 19.0
pushed 187 (15,3)
iter=102, frontier=12, popped=175 (14,3), dist2goal= 18.0
iter=103, frontier=11, popped=14 (1,15), dist2goal= 19.6
pushed 15 (1,16)
iter=104, frontier=11, popped=35 (2,16), dist2goal= 18.4
pushed 36 (2,17)
pushed 55 (3,17)
iter=105, frontier=12, popped=54 (3,16), dist2goal= 17.5
pushed 71 (4,17)
iter=106, frontier=12, popped=69 (4,15), dist2goal= 16.8
pushed 81 (5,15)
pushed 82 (5,16)
iter=107, frontier=13, popped=70 (4,16), dist2goal= 16.5
pushed 83 (5,17)
iter=108, frontier=13, popped=133 (9,6), dist2goal= 17.8
iter=109, frontier=12, popped=139 (9,12), dist2goal= 13.6
iter=110, frontier=11, popped=123 (8,13), dist2goal= 13.9
iter=111, frontier=10, popped=140 (9,13), dist2goal= 13.0
pushed 141 (9,14)
iter=112, frontier=10, popped=185 (15,1), dist2goal= 19.6
pushed 198 (16,1)
pushed 199 (16,2)

iter=113, frontier=11, popped=186 (15,2), dist2goal= 18.7
pushed 200 (16,3)
iter=114, frontier=11, popped=187 (15,3), dist2goal= 17.7
iter=115, frontier=10, popped=15 (1,16), dist2goal= 19.4
pushed 16 (1,17)
iter=116, frontier=10, popped=36 (2,17), dist2goal= 18.2
pushed 37 (2,18)
pushed 56 (3,18)
iter=117, frontier=11, popped=55 (3,17), dist2goal= 17.3
pushed 72 (4,18)
iter=118, frontier=11, popped=71 (4,17), dist2goal= 16.3
pushed 84 (5,18)
iter=119, frontier=11, popped=81 (5,15), dist2goal= 15.8
pushed 80 (5,14)
pushed 93 (6,15)
pushed 94 (6,16)
iter=120, frontier=13, popped=82 (5,16), dist2goal= 15.5
pushed 95 (6,17)
iter=121, frontier=13, popped=83 (5,17), dist2goal= 15.3
pushed 96 (6,18)
iter=122, frontier=13, popped=141 (9,14), dist2goal= 12.5
pushed 142 (9,15)
iter=123, frontier=13, popped=198 (16,1), dist2goal= 19.4
pushed 211 (17,1)
pushed 212 (17,2)
iter=124, frontier=14, popped=199 (16,2), dist2goal= 18.4
pushed 213 (17,3)
iter=125, frontier=14, popped=200 (16,3), dist2goal= 17.5
iter=126, frontier=13, popped=16 (1,17), dist2goal= 19.2
pushed 17 (1,18)
iter=127, frontier=13, popped=37 (2,18), dist2goal= 18.1
pushed 38 (2,19)
pushed 57 (3,19)
iter=128, frontier=14, popped=56 (3,18), dist2goal= 17.1
pushed 73 (4,19)
iter=129, frontier=14, popped=72 (4,18), dist2goal= 16.1
pushed 85 (5,19)
iter=130, frontier=14, popped=84 (5,18), dist2goal= 15.1
pushed 97 (6,19)
iter=131, frontier=14, popped=80 (5,14), dist2goal= 16.2
pushed 79 (5,13)
pushed 92 (6,14)
iter=132, frontier=15, popped=93 (6,15), dist2goal= 14.9
pushed 107 (7,15)
pushed 108 (7,16)
iter=133, frontier=16, popped=94 (6,16), dist2goal= 14.6
pushed 109 (7,17)
iter=134, frontier=16, popped=95 (6,17), dist2goal= 14.3

pushed 110 (7,18)
iter=135, frontier=16, popped=96 (6,18), dist2goal= 14.1
pushed 111 (7,19)
iter=136, frontier=16, popped=142 (9,15), dist2goal= 12.1
pushed 124 (8,15)
iter=137, frontier=16, popped=211 (17,1), dist2goal= 19.2
pushed 223 (18,1)
pushed 224 (18,2)
iter=138, frontier=17, popped=212 (17,2), dist2goal= 18.2
pushed 225 (18,3)
iter=139, frontier=17, popped=213 (17,3), dist2goal= 17.3
pushed 226 (18,4)
pushed 227 (18,5)
iter=140, frontier=18, popped=17 (1,18), dist2goal= 19.1
pushed 18 (1,19)
iter=141, frontier=18, popped=38 (2,19), dist2goal= 18.0
pushed 39 (2,20)
pushed 58 (3,20)
iter=142, frontier=19, popped=57 (3,19), dist2goal= 17.0
pushed 74 (4,20)
iter=143, frontier=19, popped=73 (4,19), dist2goal= 16.0
pushed 86 (5,20)
iter=144, frontier=19, popped=85 (5,19), dist2goal= 15.0
pushed 98 (6,20)
iter=145, frontier=19, popped=97 (6,19), dist2goal= 14.0
pushed 112 (7,20)
iter=146, frontier=19, popped=79 (5,13), dist2goal= 16.6
pushed 91 (6,13)
iter=147, frontier=19, popped=92 (6,14), dist2goal= 15.2
iter=148, frontier=18, popped=107 (7,15), dist2goal= 13.9
pushed 125 (8,16)
iter=149, frontier=18, popped=108 (7,16), dist2goal= 13.6
pushed 126 (8,17)
iter=150, frontier=18, popped=109 (7,17), dist2goal= 13.3
pushed 127 (8,18)
iter=151, frontier=18, popped=110 (7,18), dist2goal= 13.2
pushed 128 (8,19)
iter=152, frontier=18, popped=111 (7,19), dist2goal= 13.0
pushed 129 (8,20)
iter=153, frontier=18, popped=124 (8,15), dist2goal= 13.0
iter=154, frontier=17, popped=223 (18,1), dist2goal= 19.1
pushed 237 (19,1)
pushed 238 (19,2)
iter=155, frontier=18, popped=224 (18,2), dist2goal= 18.1
pushed 239 (19,3)
iter=156, frontier=18, popped=225 (18,3), dist2goal= 17.1
pushed 240 (19,4)
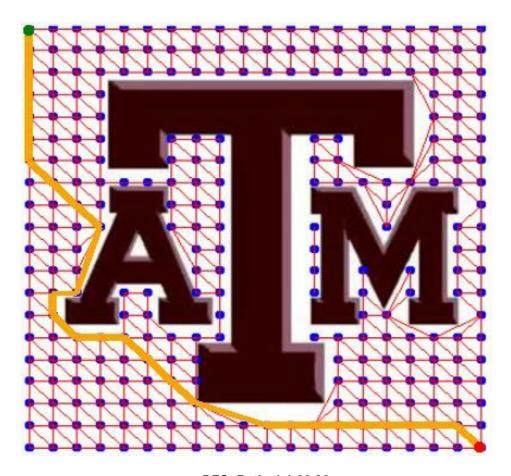iter=157, frontier=18, popped=226 (18,4), dist2goal= 16.1

pushed 241 (19,5)
iter=158, frontier=18, popped=227 (18,5), dist2goal= 15.1
pushed 228 (18,6)
pushed 242 (19,6)
pushed 214 (17,8)
iter=159, frontier=20, popped=18 (1,19), dist2goal= 19.0
pushed 19 (1,20)
iter=160, frontier=20, popped=39 (2,20), dist2goal= 18.0
iter=161, frontier=19, popped=58 (3,20), dist2goal= 17.0
iter=162, frontier=18, popped=74 (4,20), dist2goal= 16.0
iter=163, frontier=17, popped=86 (5,20), dist2goal= 15.0
iter=164, frontier=16, popped=98 (6,20), dist2goal= 14.0
iter=165, frontier=15, popped=112 (7,20), dist2goal= 13.0
iter=166, frontier=14, popped=91 (6,13), dist2goal= 15.7
iter=167, frontier=13, popped=125 (8,16), dist2goal= 12.6
iter=168, frontier=12, popped=126 (8,17), dist2goal= 12.4
iter=169, frontier=11, popped=127 (8,18), dist2goal= 12.2
pushed 143 (9,19)
pushed 148 (10,19)
pushed 153 (11,19)
iter=170, frontier=13, popped=128 (8,19), dist2goal= 12.0
pushed 144 (9,20)
iter=171, frontier=13, popped=129 (8,20), dist2goal= 12.0
iter=172, frontier=12, popped=237 (19,1), dist2goal= 19.0
pushed 255 (20,1)
pushed 256 (20,2)
iter=173, frontier=13, popped=238 (19,2), dist2goal= 18.0
pushed 257 (20,3)
iter=174, frontier=13, popped=239 (19,3), dist2goal= 17.0
pushed 258 (20,4)
iter=175, frontier=13, popped=240 (19,4), dist2goal= 16.0
pushed 259 (20,5)
iter=176, frontier=13, popped=241 (19,5), dist2goal= 15.0
pushed 260 (20,6)
iter=177, frontier=13, popped=228 (18,6), dist2goal= 14.1
pushed 229 (18,7)
pushed 243 (19,7)
iter=178, frontier=14, popped=242 (19,6), dist2goal= 14.0
pushed 261 (20,7)
iter=179, frontier=14, popped=214 (17,8), dist2goal= 12.4
pushed 201 (16,8)
pushed 230 (18,8)
pushed 202 (16,9)
pushed 203 (16,10)
iter=180, frontier=17, popped=19 (1,20), dist2goal= 19.0
iter=181, frontier=16, popped=143 (9,19), dist2goal= 11.0
pushed 149 (10,20)
iter=182, frontier=16, popped=148 (10,19), dist2goal= 10.0

pushed 154 (11,20)
iter=183, frontier=16, popped=153 (11,19), dist2goal= 9.1
pushed 158 (12,19)
pushed 159 (12,20)
iter=184, frontier=17, popped=144 (9,20), dist2goal= 11.0
iter=185, frontier=16, popped=255 (20,1), dist2goal= 19.0
iter=186, frontier=15, popped=256 (20,2), dist2goal= 18.0
iter=187, frontier=14, popped=257 (20,3), dist2goal= 17.0
iter=188, frontier=13, popped=258 (20,4), dist2goal= 16.0
iter=189, frontier=12, popped=259 (20,5), dist2goal= 15.0
iter=190, frontier=11, popped=260 (20,6), dist2goal= 14.0
iter=191, frontier=10, popped=229 (18,7), dist2goal= 13.2
pushed 244 (19,8)
iter=192, frontier=10, popped=243 (19,7), dist2goal= 13.0
pushed 262 (20,8)
iter=193, frontier=10, popped=261 (20,7), dist2goal= 13.0
iter=194, frontier=9, popped=201 (16,8), dist2goal= 12.6
pushed 188 (15,8)
pushed 177 (14,7)
iter=195, frontier=10, popped=230 (18,8), dist2goal= 12.2
iter=196, frontier=9, popped=202 (16,9), dist2goal= 11.7
iter=197, frontier=8, popped=203 (16,10), dist2goal= 10.8
iter=198, frontier=7, popped=149 (10,20), dist2goal= 10.0
iter=199, frontier=6, popped=154 (11,20), dist2goal= 9.0
iter=200, frontier=5, popped=158 (12,19), dist2goal= 8.1
pushed 171 (13,19)
pushed 172 (13,20)
iter=201, frontier=6, popped=159 (12,20), dist2goal= 8.0
iter=202, frontier=5, popped=244 (19,8), dist2goal= 12.0
pushed 263 (20,9)
iter=203, frontier=5, popped=262 (20,8), dist2goal= 12.0
iter=204, frontier=4, popped=188 (15,8), dist2goal= 13.0
pushed 178 (14,8)
iter=205, frontier=4, popped=177 (14,7), dist2goal= 14.3
pushed 176 (14,6)
pushed 164 (13,7)
pushed 163 (13,6)
iter=206, frontier=6, popped=171 (13,19), dist2goal= 7.1
pushed 183 (14,19)
pushed 182 (14,18)
pushed 184 (14,20)
pushed 181 (14,17)
iter=207, frontier=9, popped=172 (13,20), dist2goal= 7.0
iter=208, frontier=8, popped=263 (20,9), dist2goal= 11.0
pushed 264 (20,10)
pushed 245 (19,10)
iter=209, frontier=9, popped=178 (14,8), dist2goal= 13.4
pushed 165 (13,8)

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iter=210, frontier=9, popped=176 (14,6), dist2goal= 15.2
iter=211, frontier=8, popped=164 (13,7), dist2goal= 14.8
iter=212, frontier=7, popped=163 (13,6), dist2goal= 15.7
iter=213, frontier=6, popped=183 (14,19), dist2goal= 6.1
pushed 196 (15,19)
pushed 197 (15,20)
iter=214, frontier=7, popped=182 (14,18), dist2goal= 6.3
pushed 195 (15,18)
iter=215, frontier=7, popped=184 (14,20), dist2goal= 6.0
iter=216, frontier=6, popped=181 (14,17), dist2goal= 6.7
pushed 180 (14,16)
pushed 194 (15,17)
iter=217, frontier=7, popped=264 (20,10), dist2goal= 10.0
pushed 265 (20,11)
iter=218, frontier=7, popped=245 (19,10), dist2goal= 10.0
pushed 246 (19,11)
iter=219, frontier=7, popped=165 (13,8), dist2goal= 13.9
iter=220, frontier=6, popped=196 (15,19), dist2goal= 5.1
pushed 209 (16,19)
pushed 210 (16,20)
iter=221, frontier=7, popped=197 (15,20), dist2goal= 5.0
iter=222, frontier=6, popped=195 (15,18), dist2goal= 5.4
pushed 208 (16,18)
iter=223, frontier=6, popped=180 (14,16), dist2goal= 7.2
pushed 179 (14,15)
pushed 193 (15,16)
iter=224, frontier=7, popped=194 (15,17), dist2goal= 5.8
pushed 207 (16,17)
iter=225, frontier=7, popped=265 (20,11), dist2goal= 9.0
pushed 266 (20,12)
iter=226, frontier=7, popped=246 (19,11), dist2goal= 9.1
pushed 247 (19,12)
iter=227, frontier=7, popped=209 (16,19), dist2goal= 4.1
pushed 221 (17,19)
pushed 222 (17,20)
iter=228, frontier=8, popped=210 (16,20), dist2goal= 4.0
iter=229, frontier=7, popped=208 (16,18), dist2goal= 4.5
pushed 220 (17,18)
iter=230, frontier=7, popped=179 (14,15), dist2goal= 7.8
pushed 170 (13,15)
pushed 192 (15,15)
iter=231, frontier=8, popped=193 (15,16), dist2goal= 6.4
pushed 206 (16,16)
iter=232, frontier=8, popped=207 (16,17), dist2goal= 5.0
pushed 219 (17,17)
iter=233, frontier=8, popped=266 (20,12), dist2goal= 8.0
pushed 267 (20,13)
iter=234, frontier=8, popped=247 (19,12), dist2goal= 8.1
```

pushed 248 (19,13)
iter=235, frontier=8, popped=221 (17,19), dist2goal= 3.2
pushed 235 (18,19)
pushed 236 (18,20)
iter=236, frontier=9, popped=222 (17,20), dist2goal= 3.0
iter=237, frontier=8, popped=220 (17,18), dist2goal= 3.6
pushed 234 (18,18)
iter=238, frontier=8, popped=170 (13,15), dist2goal= 8.6
iter=239, frontier=7, popped=192 (15,15), dist2goal= 7.1
pushed 191 (15,14)
pushed 205 (16,15)
iter=240, frontier=8, popped=206 (16,16), dist2goal= 5.7
pushed 218 (17,16)
iter=241, frontier=8, popped=219 (17,17), dist2goal= 4.2
pushed 233 (18,17)
iter=242, frontier=8, popped=267 (20,13), dist2goal= 7.0
pushed 268 (20,14)
iter=243, frontier=8, popped=248 (19,13), dist2goal= 7.1
iter=244, frontier=7, popped=235 (18,19), dist2goal= 2.2
pushed 253 (19,19)
pushed 254 (19,20)
iter=245, frontier=8, popped=236 (18,20), dist2goal= 2.0
iter=246, frontier=7, popped=234 (18,18), dist2goal= 2.8
pushed 252 (19,18)
iter=247, frontier=7, popped=191 (15,14), dist2goal= 7.8
pushed 190 (15,13)
pushed 204 (16,14)
iter=248, frontier=8, popped=205 (16,15), dist2goal= 6.4
pushed 217 (17,15)
iter=249, frontier=8, popped=218 (17,16), dist2goal= 5.0
pushed 232 (18,16)
iter=250, frontier=8, popped=233 (18,17), dist2goal= 3.6
pushed 251 (19,17)
iter=251, frontier=8, popped=268 (20,14), dist2goal= 6.0
pushed 269 (20,15)
pushed 249 (19,15)
pushed 231 (18,15)
iter=252, frontier=10, popped=253 (19,19), dist2goal= 1.4
pushed 273 (20,19)
pushed 274 (20,20)
iter=253, frontier=11, popped=254 (19,20), dist2goal= 1.0
iter=254, frontier=10, popped=252 (19,18), dist2goal= 2.2
pushed 272 (20,18)
iter=255, frontier=10, popped=190 (15,13), dist2goal= 8.6
pushed 189 (15,12)
iter=256, frontier=10, popped=204 (16,14), dist2goal= 7.2
pushed 216 (17,13)
pushed 215 (17,12)

iter=257, frontier=11, popped=217 (17,15), dist2goal= 5.8
iter=258, frontier=10, popped=232 (18,16), dist2goal= 4.5
pushed 250 (19,16)
iter=259, frontier=10, popped=251 (19,17), dist2goal= 3.2
pushed 271 (20,17)
iter=260, frontier=10, popped=269 (20,15), dist2goal= 5.0
pushed 270 (20,16)
iter=261, frontier=10, popped=249 (19,15), dist2goal= 5.1
iter=262, frontier=9, popped=231 (18,15), dist2goal= 5.4
iter=263, frontier=8, popped=273 (20,19), dist2goal= 1.0
iter=264, frontier=7, popped=274 (20,20), dist2goal= 0.0
==============
Solution path:
  vertex 0 (1,1)
  vertex 1 (1,2)
  vertex 2 (1,3)
  vertex 3 (1,4)
  vertex 4 (1,5)
  vertex 5 (1,6)
  vertex 6 (1,7)
  vertex 27 (2,8)
  vertex 48 (3,9)
  vertex 68 (4,10)
  vertex 52 (3,13)
  vertex 32 (2,13)
  vertex 33 (2,14)
  vertex 53 (3,15)
  vertex 69 (4,15)
  vertex 81 (5,15)
  vertex 94 (6,16)
  vertex 109 (7,17)
  vertex 127 (8,18)
  vertex 153 (11,19)
  vertex 158 (12,19)
  vertex 171 (13,19)
  vertex 183 (14,19)
  vertex 196 (15,19)
  vertex 209 (16,19)
  vertex 221 (17,19)
  vertex 235 (18,19)
  vertex 253 (19,19)
  vertex 274 (20,20)
Search Algortihm = BFS
Total Iterations = 264
Max Frontier Size = 21
Vertices visited   = 271/275
Path length   = 28

DFS- Path: 1 1 20 20

==

Breadth First Search:
> C:\Anuj\Artificial_Intelligence625\HW1\ATM.graph.txt 1 1 20 20 1 DFS
verices=275, edges=641
start=(1,1), goal=(20,20), vertices: 0 and 274
iter=1, frontier=0, popped=0 (1,1), dist2goal= 26.9
pushed 1 (1,2)
pushed 20 (2,1)
pushed 21 (2,2)
iter=2, frontier=2, popped=21 (2,2), dist2goal= 25.5
pushed 22 (2,3)
pushed 41 (3,2)
pushed 42 (3,3)
iter=3, frontier=4, popped=42 (3,3), dist2goal= 24.0
pushed 43 (3,4)
pushed 61 (4,3)
pushed 62 (4,4)
iter=4, frontier=6, popped=62 (4,4), dist2goal= 22.6
pushed 63 (4,5)

iter=5, frontier=6, popped=63 (4,5), dist2goal= 21.9
pushed 64 (4,6)
pushed 44 (3,5)
iter=6, frontier=7, popped=44 (3,5), dist2goal= 22.7
pushed 45 (3,6)
pushed 24 (2,5)
pushed 23 (2,4)
iter=7, frontier=9, popped=23 (2,4), dist2goal= 24.1
pushed 3 (1,4)
pushed 2 (1,3)
iter=8, frontier=10, popped=2 (1,3), dist2goal= 25.5
iter=9, frontier=9, popped=3 (1,4), dist2goal= 24.8
pushed 4 (1,5)
iter=10, frontier=9, popped=4 (1,5), dist2goal= 24.2
pushed 5 (1,6)
pushed 25 (2,6)
iter=11, frontier=10, popped=25 (2,6), dist2goal= 22.8
pushed 26 (2,7)
pushed 46 (3,7)
iter=12, frontier=11, popped=46 (3,7), dist2goal= 21.4
pushed 47 (3,8)
pushed 65 (4,7)
pushed 66 (4,8)
iter=13, frontier=13, popped=66 (4,8), dist2goal= 20.0
pushed 67 (4,9)
pushed 78 (5,8)
iter=14, frontier=14, popped=78 (5,8), dist2goal= 19.2
pushed 90 (6,8)
iter=15, frontier=14, popped=90 (6,8), dist2goal= 18.4
pushed 104 (7,8)
iter=16, frontier=14, popped=104 (7,8), dist2goal= 17.7
pushed 103 (7,7)
pushed 105 (7,9)
pushed 118 (8,8)
pushed 119 (8,9)
iter=17, frontier=17, popped=119 (8,9), dist2goal= 16.3
pushed 120 (8,10)
pushed 136 (9,9)
pushed 137 (9,10)
iter=18, frontier=19, popped=137 (9,10), dist2goal= 14.9
pushed 138 (9,11)
iter=19, frontier=19, popped=138 (9,11), dist2goal= 14.2
pushed 139 (9,12)
pushed 121 (8,11)
iter=20, frontier=20, popped=121 (8,11), dist2goal= 15.0
pushed 122 (8,12)
pushed 106 (7,10)
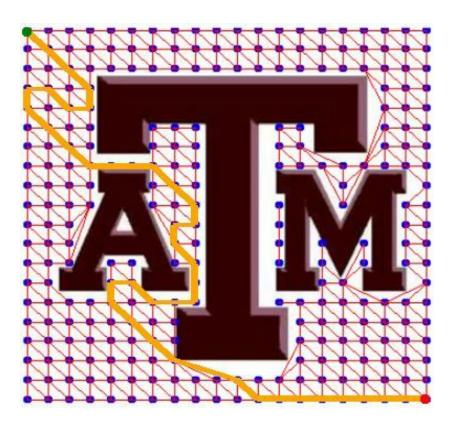iter=21, frontier=21, popped=106 (7,10), dist2goal= 16.4

```
iter=22, frontier=20, popped=122 (8,12), dist2goal= 14.4
pushed 123 (8,13)
pushed 140 (9,13)
iter=23, frontier=21, popped=140 (9,13), dist2goal= 13.0
pushed 141 (9,14)
iter=24, frontier=21, popped=141 (9,14), dist2goal= 12.5
pushed 142 (9,15)
iter=25, frontier=21, popped=142 (9,15), dist2goal= 12.1
pushed 124 (8,15)
iter=26, frontier=21, popped=124 (8,15), dist2goal= 13.0
pushed 125 (8,16)
pushed 107 (7,15)
iter=27, frontier=22, popped=107 (7,15), dist2goal= 13.9
pushed 108 (7,16)
pushed 93 (6,15)
pushed 92 (6,14)
iter=28, frontier=24, popped=92 (6,14), dist2goal= 15.2
pushed 91 (6,13)
pushed 80 (5,14)
pushed 79 (5,13)
iter=29, frontier=26, popped=79 (5,13), dist2goal= 16.6
iter=30, frontier=25, popped=80 (5,14), dist2goal= 16.2
pushed 81 (5,15)
iter=31, frontier=25, popped=81 (5,15), dist2goal= 15.8
pushed 82 (5,16)
pushed 69 (4,15)
pushed 94 (6,16)
iter=32, frontier=27, popped=94 (6,16), dist2goal= 14.6
pushed 95 (6,17)
pushed 109 (7,17)
iter=33, frontier=28, popped=109 (7,17), dist2goal= 13.3
pushed 110 (7,18)
pushed 126 (8,17)
pushed 127 (8,18)
iter=34, frontier=30, popped=127 (8,18), dist2goal= 12.2
pushed 128 (8,19)
pushed 143 (9,19)
pushed 148 (10,19)
pushed 153 (11,19)
iter=35, frontier=33, popped=153 (11,19), dist2goal= 9.1
pushed 154 (11,20)
pushed 158 (12,19)
pushed 159 (12,20)
iter=36, frontier=35, popped=159 (12,20), dist2goal= 8.0
pushed 172 (13,20)
iter=37, frontier=35, popped=172 (13,20), dist2goal= 7.0
pushed 171 (13,19)
pushed 184 (14,20)
```

iter=38, frontier=36, popped=184 (14,20), dist2goal= 6.0
pushed 183 (14,19)
pushed 197 (15,20)
iter=39, frontier=37, popped=197 (15,20), dist2goal= 5.0
pushed 196 (15,19)
pushed 210 (16,20)
iter=40, frontier=38, popped=210 (16,20), dist2goal= 4.0
pushed 209 (16,19)
pushed 222 (17,20)
iter=41, frontier=39, popped=222 (17,20), dist2goal= 3.0
pushed 221 (17,19)
pushed 236 (18,20)
iter=42, frontier=40, popped=236 (18,20), dist2goal= 2.0
pushed 235 (18,19)
pushed 254 (19,20)
iter=43, frontier=41, popped=254 (19,20), dist2goal= 1.0
pushed 253 (19,19)
pushed 274 (20,20)
iter=44, frontier=42, popped=274 (20,20), dist2goal= 0.0
==============
Solution path:
  vertex 0 (1,1)
  vertex 21 (2,2)
  vertex 42 (3,3)
  vertex 62 (4,4)
  vertex 63 (4,5)
  vertex 44 (3,5)
  vertex 23 (2,4)
  vertex 3 (1,4)
  vertex 4 (1,5)
  vertex 25 (2,6)
  vertex 46 (3,7)
  vertex 66 (4,8)
  vertex 78 (5,8)
  vertex 90 (6,8)
  vertex 104 (7,8)
  vertex 119 (8,9)
  vertex 137 (9,10)
  vertex 138 (9,11)
  vertex 121 (8,11)
  vertex 122 (8,12)
  vertex 140 (9,13)
  vertex 141 (9,14)
  vertex 142 (9,15)
  vertex 124 (8,15)
  vertex 107 (7,15)
  vertex 92 (6,14)
  vertex 80 (5,14)

vertex 81 (5,15)
vertex 94 (6,16)
vertex 109 (7,17)
vertex 127 (8,18)
vertex 153 (11,19)
vertex 159 (12,20)
vertex 172 (13,20)
vertex 184 (14,20)
vertex 197 (15,20)
vertex 210 (16,20)
vertex 222 (17,20)
vertex 236 (18,20)
vertex 254 (19,20)
vertex 274 (20,20)
Search Algortihm = DFS
Total Iterations = 44
Max Frontier Size = 43
Vertices visited   = 86/275
Path length   = 40

DFS - Path : 1 1 20 20

==

Greedy Best First Search

verices=275, edges=641
start=(1,1), goal=(20,20), vertices: 0 and 274
iter=1, frontier=0, popped=0 (1,1), dist2goal= 26.9
pushed 1 (1,2)
pushed 20 (2,1)
pushed 21 (2,2)
iter=2, frontier=2, popped=21 (2,2), dist2goal= 25.5
pushed 22 (2,3)
pushed 41 (3,2)
pushed 42 (3,3)
iter=3, frontier=4, popped=42 (3,3), dist2goal= 24.0
pushed 43 (3,4)
pushed 61 (4,3)
pushed 62 (4,4)
iter=4, frontier=6, popped=62 (4,4), dist2goal= 22.6
pushed 63 (4,5)
iter=5, frontier=6, popped=63 (4,5), dist2goal= 21.9
pushed 64 (4,6)
pushed 44 (3,5)
iter=6, frontier=7, popped=64 (4,6), dist2goal= 21.3
pushed 65 (4,7)
pushed 45 (3,6)
iter=7, frontier=8, popped=65 (4,7), dist2goal= 20.6
pushed 66 (4,8)
pushed 46 (3,7)
iter=8, frontier=9, popped=66 (4,8), dist2goal= 20.0
pushed 67 (4,9)
pushed 78 (5,8)
pushed 47 (3,8)
iter=9, frontier=11, popped=78 (5,8), dist2goal= 19.2
pushed 90 (6,8)
iter=10, frontier=11, popped=90 (6,8), dist2goal= 18.4
pushed 104 (7,8)
iter=11, frontier=11, popped=104 (7,8), dist2goal= 17.7
pushed 103 (7,7)
pushed 105 (7,9)
pushed 118 (8,8)
pushed 119 (8,9)
iter=12, frontier=14, popped=119 (8,9), dist2goal= 16.3
pushed 120 (8,10)
pushed 136 (9,9)
pushed 137 (9,10)
iter=13, frontier=16, popped=137 (9,10), dist2goal= 14.9
pushed 138 (9,11)
iter=14, frontier=16, popped=138 (9,11), dist2goal= 14.2
pushed 139 (9,12)

```
pushed 121 (8,11)
iter=15, frontier=17, popped=139 (9,12), dist2goal= 13.6
pushed 140 (9,13)
pushed 122 (8,12)
iter=16, frontier=18, popped=140 (9,13), dist2goal= 13.0
pushed 141 (9,14)
pushed 123 (8,13)
iter=17, frontier=19, popped=141 (9,14), dist2goal= 12.5
pushed 142 (9,15)
iter=18, frontier=19, popped=142 (9,15), dist2goal= 12.1
pushed 124 (8,15)
iter=19, frontier=19, popped=124 (8,15), dist2goal= 13.0
pushed 125 (8,16)
pushed 107 (7,15)
iter=20, frontier=20, popped=125 (8,16), dist2goal= 12.6
pushed 126 (8,17)
pushed 108 (7,16)
iter=21, frontier=21, popped=126 (8,17), dist2goal= 12.4
pushed 127 (8,18)
pushed 109 (7,17)
iter=22, frontier=22, popped=127 (8,18), dist2goal= 12.2
pushed 128 (8,19)
pushed 110 (7,18)
pushed 143 (9,19)
pushed 148 (10,19)
pushed 153 (11,19)
iter=23, frontier=26, popped=153 (11,19), dist2goal= 9.1
pushed 154 (11,20)
pushed 158 (12,19)
pushed 159 (12,20)
iter=24, frontier=28, popped=159 (12,20), dist2goal= 8.0
pushed 172 (13,20)
iter=25, frontier=28, popped=172 (13,20), dist2goal= 7.0
pushed 171 (13,19)
pushed 184 (14,20)
iter=26, frontier=29, popped=184 (14,20), dist2goal= 6.0
pushed 183 (14,19)
pushed 197 (15,20)
iter=27, frontier=30, popped=197 (15,20), dist2goal= 5.0
pushed 196 (15,19)
pushed 210 (16,20)
iter=28, frontier=31, popped=210 (16,20), dist2goal= 4.0
pushed 209 (16,19)
pushed 222 (17,20)
iter=29, frontier=32, popped=222 (17,20), dist2goal= 3.0
pushed 221 (17,19)
pushed 236 (18,20)
iter=30, frontier=33, popped=236 (18,20), dist2goal= 2.0
```

pushed 235 (18,19)
pushed 254 (19,20)
iter=31, frontier=34, popped=254 (19,20), dist2goal= 1.0
pushed 253 (19,19)
pushed 274 (20,20)
iter=32, frontier=35, popped=274 (20,20), dist2goal= 0.0
==============
Solution path:
  vertex 0 (1,1)
  vertex 21 (2,2)
  vertex 42 (3,3)
  vertex 62 (4,4)
  vertex 63 (4,5)
  vertex 64 (4,6)
  vertex 65 (4,7)
  vertex 66 (4,8)
  vertex 78 (5,8)
  vertex 90 (6,8)
  vertex 104 (7,8)
  vertex 119 (8,9)
  vertex 137 (9,10)
  vertex 138 (9,11)
  vertex 139 (9,12)
  vertex 140 (9,13)
  vertex 141 (9,14)
  vertex 142 (9,15)
  vertex 124 (8,15)
  vertex 125 (8,16)
  vertex 126 (8,17)
  vertex 127 (8,18)
  vertex 153 (11,19)
  vertex 159 (12,20)
  vertex 172 (13,20)
  vertex 184 (14,20)
  vertex 197 (15,20)
  vertex 210 (16,20)
  vertex 222 (17,20)
  vertex 236 (18,20)
  vertex 254 (19,20)
  vertex 274 (20,20)
Search Algortihm = GBFS
Total Iterations = 32
Max Frontier Size = 36
Vertices visited   = 67/275
Path length   = 31

GBFS - Path : 1 1 20 20

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