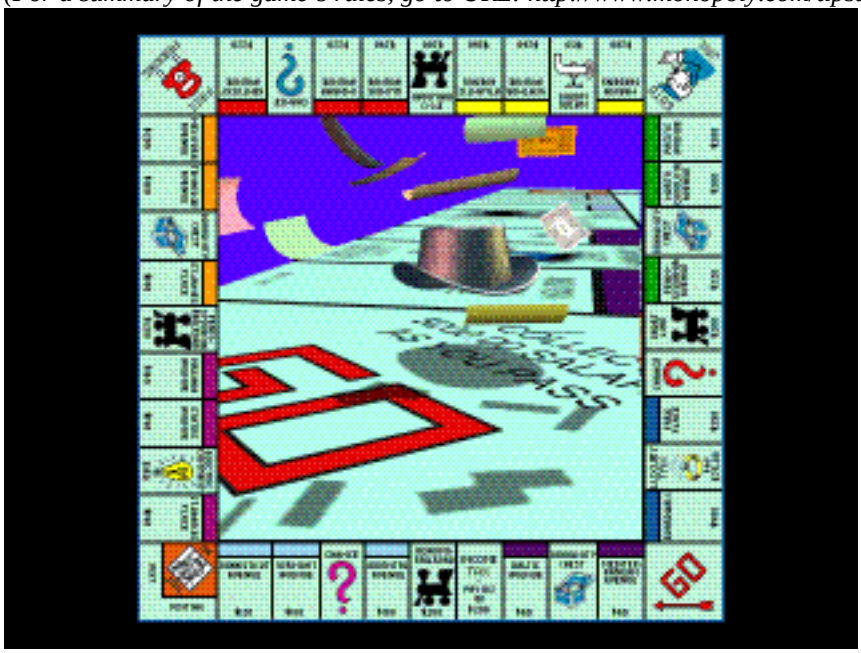
The Game of Monopoly

(cf. p. 979, *Operations Research: Applications & Algorithms*, 3rd edition, by Wayne Winston).

The position of a player's piece in the game of Monopoly may be modeled as a Markov chain.

(For a summary of the game's rules, go to URL: http://www.monopoly.com/tipstricks/game_rules.htm)



The table below shows the steady-state probabilities of this Markov chain.

- On average, how many rolls of the dice are required between visits to the Boardwalk?
- Which is a better investment: Electric Company or Water works?
- Which railroad is visited most frequently?

Steady-state probabilities for the game of Monopoly

State #	Position	Steady-state probability
0	Go	0.0346
1	Mediterranean Ave.	0.0237
2	Community Chest 1	0.0218
3	Baltic Ave.	0.0241
4	Income tax	0.0261
5	Reading RR	0.0332
6	Oriental Ave	0.0253
7	Chance 1	0.0096
8	Vermont Ave	0.0258
9	Connecticut Ave	0.0237
10	Visiting Jail	0.0254
11	St. Charles Place	0.0304
12	Electric Co	0.0311
13	State Ave	0.0258
14	Virginia Ave	0.0288
15	Pennsylvania RR	0.0313
16	St. James Place	0.0318
17	Community Chest 2	0.0272
18	Tennessee Ave.	0.0335
19	New York Ave.	0.0334
20	Free Parking	0.0336
21	Kentucky Ave	0.0310
22	Chance 2	0.0125
23	Indiana Ave	0.0305
24	Illinois Ave	0.0355
25	B&O RR	0.0344
26	Atlantic Ave	0.0301
27	Ventnor Ave	0.0299
28	Water works	0.0315
29	Marvin Gardens	0.0289
30	Jail	0.1123
31	Pacific Ave	0.0300
32	N Carolina Ave	0.0294
33	Community Chest 3	0.0263
34	Pennsylvania Ave	0.0279
35	Short Line RR	0.0272
36	Chance 3	0.0096
37	Park Place	0.0245
38	Luxury Tax	0.0245
40	Boardwalk	0.0295

Source: R. Ash & R. Bishop, “Monopoly as a Markov Process”, *Mathematics Magazine*, vol. 45(1972), pp. 26-29.