
An Introduction to Game-Theoretic Modelling: Errata

Mesterton-Gibbons, STML 11 (March 20, 2004)

Page 15, immediately above (1.24): Replace “ $f_1(u, \bar{v})$ ” by “ $f_2(u, \bar{v})$ ”

Page 45, Line 4: Replace “ie.” by “i.e.”

Page 46, Exercise 3: Replace “dominant” by “strongly dominant”

Page 49, Exercise 28: Replace “Find all Nash-equilibrium strategies for (a) $\lambda > 0$ and (b) $\lambda < 0$ ” by “Find all Nash-equilibrium strategy combinations”

Page 50, Exercise 33: Replace “ $u^* = (\frac{3}{35}, \frac{18}{35}, \frac{8}{35}, \frac{6}{35}, 0)$ and $v^* = (\frac{4}{7}, \frac{2}{7}, 0, \frac{3}{35}, \frac{2}{35})$ ” by “ $u^* = (\frac{2}{21}, \frac{4}{7}, \frac{1}{7}, \frac{4}{21}, 0)$ and $v^* = (\frac{4}{7}, \frac{4}{21}, \frac{2}{21}, \frac{1}{7}, 0)$ ”

Page 72, §2.5, Paragraph 2, Line 2: Replace “ $x_1(t)$ and $x_1(t)$ ” by “ $x_1(t)$ and $x_2(t)$ ”

Page 91, Line 16: Delete “; see Exercise 2.22”

Page 97, Exercise 8: Replace by “Show that $R = (0, 0)$ and $(\theta, 1 - \theta)$, where θ is defined by (2.16), are both evolutionarily stable strategies in the Hawk-Dove-Retaliator game defined by Exercise 1.27 if $\rho < C$.”

Pages 98-99, Exercise 22 and Footnote 13: Replace by “In this exercise, you will use a calculator or computer to solve (2.52) with Table 2.2’s payoff matrix for $\lambda = 0.9$. First define $\xi(c) = (0, c, 0, 1 - c)$ and $\xi_\delta(c) = (\delta_1, c - \delta_1 - \delta_2, \delta_2, 1 - c)$.

- (a) Consider a mixture of HD and DD with initial proportion c_0 of HD . For various values of c_0 close to 1 (e.g., in the range $0.9 < c_0 < 1$) and small positive δ_1, δ_2 (representing mutation from HD to HH or DH), let $\xi(c_0)$ be perturbed to $\xi_\delta(c_0)$, and solve (2.52) with $x(0) = \xi_\delta(c_0)$. Show that $x(n) \rightarrow \xi(c_1)$ as $n \rightarrow \infty$ where $c_1 < c_0$ (but $c_1 \approx c_0$).¹³
- (b) In each case, solve (2.52) with $x(0) = \xi_\delta(c_1)$ to show that $x(n) \rightarrow \xi(c_2)$ as $n \rightarrow \infty$ where $c_2 < c_1$ (but again $c_2 \approx c_1$); and repeat for successive values of c_m . Together, (a) and (b) illustrate how infiltration by HH or DH can steadily reduce the proportion of HD and increase the proportion of DD , ultimately causing the population to evolve to DH .
- (c) Now solve (2.52) with $x(0) = \frac{1}{3}(1 - \alpha, 3\alpha, 1 - \alpha, 1 - \alpha)$ for various values of $\alpha \in (0, 1)$. Show that there is a critical value of α , say α_c , such that $x(n) \rightarrow (0, c, 0, 1 - c)$ with $c > \alpha$ as $n \rightarrow \infty$ for $\alpha > \alpha_c$, but $x(n) \rightarrow (0, 0, 1, 0)$ as $n \rightarrow \infty$ for $\alpha < \alpha_c$. What is the value of α_c ? Again, these dynamics illustrate that repeated infiltration by HH and DH will ultimately cause the population to evolve to DH .
- (d) Criticize the use of (2.52) with (2.50) and (2.77) for the long-term dynamics of Owners and Intruders.”

¹³ $x(0)$ in this exercise is the initial composition of the population in §2.6; it has nothing to do with the initial distribution of states for a play of Owners and Intruders. Also, we assume that DD cannot mutate to one of the other three strategies, because it is not even a potentially aggressive strategy.

Page 112, six lines from bottom: Replace “ $u > \frac{1}{5}$ ” (at end of line) by “ $u > \frac{3}{5}$ ”

Page 126, Footnote 4: In Line 3, replace first and last “ $\tau_2/2$ ” by “ $\tau_1/2$;” in Line 5, replace second “ $\tau_2/2$ ” by “ $\tau_1/2$ ”

Page 158, Display (4.85): Replace “ $\nu(\{1, 3\}) = \frac{11}{8}$ ” by “ $\nu(\{2, 3\}) = \frac{11}{8}$ ”

Page 325, Solution 27: Close gap in “Nash- equilibrium”

Page 326, Solution 33 (b): Replace by “On using (a) and (1.15), we have $f_1(u, v) = (v_2 + v_3)u_1 + 2(v_4 + v_5)u_2 + (1 - v_1 - 3v_3 + v_4 - 4v_5)u_3 - (v_1 - 3v_2 - 2v_4 + 3v_5)u_4 - (v_1 - v_2 + 2v_3 - 5v_4)u_5 - v_2 - 2v_4$, implying $f_1(u^*, v^*) = -\frac{4}{21}$. Player 1 has no incentive to depart unilaterally from u^* if the maximum of $f_1(u, v^*) = \frac{1}{21}(6\{u_1 + u_2 + u_3 + u_4 + u_5\} - 10 - 3u_5)$ subject to $u_1 + u_2 + u_3 + u_4 + u_5 \leq 1$ is $-\frac{4}{21}$. The inequality implies $f_1(u, v^*) \leq -\frac{4}{21} - \frac{1}{7}u_5$, which is maximized where $u_5 = 0$. Similarly for Player 2.”

Page 327, Solution 2: The second part is the solution to (c), not (b)

Page 327, Solution 8: Replace “ $(\frac{1}{2}, \frac{1}{2})$ ” by “ $(\theta, 1 - \theta)$ ”

Page 332, Solution 10: Replace “ $(\tilde{f}_1, \tilde{f}_1)$ ” by “ $(\tilde{f}_1, \tilde{f}_2)$ ” in Line 1; replace “ $-\frac{1}{2}(\tau_1, \tau_2)$ ” by “ $-\frac{1}{2}(\tau_2, \tau_1)$ ” in the display

Page 334, Solution 5: Replace “ $C^+(-\frac{11}{20})$ ” by “ $C^+(-\frac{11}{120})$ ”