An Introduction to Game-Theoretic Modelling: Errata

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

Page 15, immediately above (1.24): Replace "$f_1(u, \overline{v})$" by "$f_2(u, \overline{v})$"

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 "$u^* = \left(\frac{3}{35}, \frac{18}{35}, \frac{8}{35}, \frac{6}{35}, 0\right)$ and $v^* = \left(\frac{4}{7}, \frac{2}{7}, 0, \frac{3}{35}, \frac{2}{35}\right)$" by "$u^* = \left(\frac{2}{21}, \frac{4}{7}, \frac{1}{7}, \frac{4}{21}, 0\right)$ and $v^* = \left(\frac{4}{7}, \frac{4}{21}, \frac{2}{21}, \frac{1}{7}, 0\right)$"

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 $x(n) \to \xi(c_1)$ as $n \to \infty$ 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 $x(n) \to \xi(c_2)$ as $n \to \infty$ 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 $x(n) \to (0, c, 0, 1-c)$ with $c > \alpha$ as $n \to \infty$ for $\alpha > \alpha_c$, but $x(n) \to (0, 0, 1, 0)$ as $n \to \infty$ 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."

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[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 $u_1 + u_2 + u_3 + u_4 + u_5 \le 1$ is $-\frac{4}{21}$. The inequality implies $f_1(u, v^*) \le -\frac{4}{21} - \frac{1}{7}u_5$, 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 "$\left(\frac{1}{2}, \frac{1}{2}\right)$" 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 "$C^+\left(-\frac{11}{20}\right)$" by "$C^+\left(-\frac{11}{120}\right)$"