Additions and Errata to Second Printing of *An Introduction to Symbolic Dynamics and Coding*

July 9, 2012

Since original publication of the text, there has been substantial progress on several problems, far too many to list here. However, we cannot resist mentioning a few of these:

- Solution, in the affirmative, of the Road Problem (Problem 5.1.3, page 138): A.N. Trahtman, "The road coloring problem," Israel J. Math, 172 (2009), 51 - 60.
- Solution, in the affirmative, of the Spectral Conjecture (Conjecture 11.2.5, page 383): K. H. Kim, N. Ormes, F. Roush. "The spectra of nonnegative integer matrices via formal power series," J. Amer. Math. Soc. 13 (2000), 773 - 806.
- A complete characterization of the set of numbers that occur as entropies of 2-dimensional shifts of finite type; the characterization is remarkably different from the corresponding characterization in 1 dimension (Theorems 11.1.4 and 11.1.5, page 369): M. Hochman and T. Meyerovitch, "A characterization of the entropies of multidimensional shifts of finite type," Annals of Mathematics, to appear.
- Solution, in the negative, to the shift equivalence problem for irreducible matrices (Problem 7.3.14, page 240 in first printing); this was already incorporated in the second printing.

Errata found since second printing

p. 23, Exercise 1.5.17 should read: "Show that the S-gap shift and the S'-gap shift are conjugate if and only if either $S = S'$ or for some n, $S = \{0, n\}$ and $S' = \{n, n+1, \ldots\}$."

p. 25, equation (1-6-3): replace "$e' \neq c' + c + d$ " with "$e' \neq c' + c + d'$ "

p. 40, Problem 2.2.15(a), assume that m and n are both nonnegative.

p. 46, after line 2, insert: "We assume that if $\mu(J|I) > 0$, then $\mu(I) > 0$ and $\mu(J) > 0$, and if $\mu(J) > 0$, then $\mu(J|I) > 0$ for some I."

p. 47, after line 2, insert: "We assume that if $\mu(e|i(e)) > 0$, then $\mu(i(e)) > 0$ and $\mu(t(e)) > 0$, and if $\mu(J) > 0$, then $\mu(e|i(e)) > 0$ for some edge e with $t(e) = J$."

p. 48, line 6 and p. 49, line 4 of Exercise 2.3.9:: replace "begin" with "end."

p. 51, line 2 of Definition 2.4.3 and p. 53, line 2 of Definition 2.4.7: the partition elements $\mathcal{E}_I^j$ and $\mathcal{E}_i^J$ should be assumed to be nonempty.

p. 76, line -7: the proof that $w \in \mathcal{B}(X_{\mathcal{H}})$ is not quite complete because H need not be essential; however, if one extends w to a longer block w' by pre-pending and appending sufficiently long blocks, then w' is the label of a path that begins and ends on cycles in $\mathcal{H}$ and thus $w \in \mathcal{B}(X_{\mathcal{H}})$

p. 80, line 9: the assertion $B(X_{\mathcal{H}}) = B(X_{\mathcal{G}})$ follows for the same reason as given above for p. 76, line -7.

p. 115, last line: add "if $h(X) > 0$ and $-\infty$ if $h(X) = 0$"

p. 116, Exercise 4.3.2(c): the matrix A should be assumed to be irreducible; and replace "$\log(A_{IJ}/m)$" with "$\log(A_{IJ})/m$"

p. 131, line 1 of Corollary 4.5.13 (1): assume "$A \neq [1]$"

p. 131, line 1 of Corollary 4.5.13 (2): assume "$h(X) > 0$"

p. 134, line 3 of Exercise 4.5.14: replace "$\mathbf{w} \cdot \mathbf{v} = 1$" with "$\mathbf{w} \cdot \mathbf{v} = p$"

p. 140, line 13, and Proposition 5.1.6 and p. 141, Proposition 5.1.7: assume that G is essential.

p. 141, first line of proof of Proposition 5.1.7: delete "We may assume that G is essential."

p. 142, line 3: replace $e^{i_0} = f^{j_0}$ with $e_0^{i_0} = f_0^{j_0}$.

p. 144, Exercise 5.1.8: replace the definition of H with: "Let H be the (unlabeled) subgraph of $\mathcal{K}$ determined by all states of $\mathcal{K}$ which are terminal states of a path with initial state of the form (I, I) and initial edge of the form $(e, f), e \neq f$."

p. 157, line 2 of Lemma 5.4.3: replace $\sum_{s \in S} k_q$ with $\sum_{q \in S} k_q$

p. 214, Exercise 6.5.9: replace "irreducible" with "mixing" in both parts (a) and (b).

p. 257, last sentence; replace with "Since A is invertible over Z, any element of D_A^+ (i.e., equivalence class of m-beams) may be identified with an integral combination $a[R_1] + b[R_2]$ where $[a, b] \in \cup_{n=0}^{\infty} A^{-n}((Z^+)^2)$ and

$$D_A = (Z \cdot [R_1]) + (Z \cdot [R_2]) \cong Z^2$$

p. 258, line 1: replace m by a and n by b

p. 258, line 11: replace the line with: "by $\theta([U]) = \delta_A^{-r-m}(\mathbf{v}_{U,m}A^r)$. Note that $\theta([U]) = \delta_A^{-s-m}(\mathbf{v}_{U,m}A^s)$ for all $s \geq r$" and accordingly change the notation in the proof of Theorem 7.5.13.

p. 312, Exercise 9.1.8 (b): add the condition that "ϕ is not one-to-one"

p. 366, line 7 of Exercisee 10.3.9; replace "Y" with "for some N, there"

p. 395, Exercise 11.2.7: delete

p. 408, lines -15 and -16: after "Jordan blocks of B" insert "away from zero"; after "Jordan blocks of A" insert "away from zero"

p. 408, line -9 and p. 410, line 2 of Exercise 12.1.6: replace "$\psi : \mathcal{R}_A \to \mathcal{R}_B$" with "$\psi : \mathcal{R}_B \to \mathcal{R}_A$"

p. 410, line 1, add the condition "$h(X_A) = h(X_B)$"

p. 416, Exercise 12.2.7, line 3: "mixing" should be replaced with "irreducible"

p. 424, Exercise 12.3.8, the characteristic polynomial of B should also be assume to be irreducible.