Formal Models of Computation
Errata

Chapter 0

• page 3 — the third line of the last paragraph should read: Russell's paradox that is stated as follows: let r denote the set of all those.

• page 6 — the second line in the fourth paragraph should read: operation, written p(S), that is the collection of all subsets of S, p(S) = {T l

Chapter 1

• page 57 — the equation in line 4 has an extra nested parenthesis, it should read:

□*(s,□$_1$) = □-closure({t l □r□□-closure(s) with t□□(r,□$_1$)} (thanks to Jie Peng).

• page 63 — the last paragraph of Example 1.3.1 should refer to Exercise 1.45.

• page 63 — the second line of Theorem 1.3.2 should refer to Theorem 1.2.4 and 1.2.2 (thanks to Jie Peng)

• page 65 — the equation in line 1 should read: □(t, □) = □$_2$(t, □) for all …

• page 86 — problem 1.32 should refer to the previous problem, 1.31.

Chapter 2

• page 91 — the third line of Theorem 2.1.1 should read: z□L with len(z) ≥ N … (thanks to Wei Jiang).

• page 92 — the third line below Figure 2.1.1 should read: len(v) ≥ 1 … (thanks to Wei Jiang).

• page 114 — the first line of the second paragraph should read: Conversely, if val(x) mod 3 ≠ val(y) mod 3 … (thanks to Jie Peng).

• page 128 — problem 2.1(g) should read: L_g = {x□□* l □w,y,z□□$^+$ so x=wy *and* x=zw} (thanks to Eduard Dragut).

Chapter 3

• page 148 — line 2 should read: integer k≥0 …

• page 149 — the third line before the end of Example 3.2.1 should read: from the same state (s_2) … (thanks to Wei Jiang).

• page 183 — in problem number 3.22, the two parenthetical references to n should read: (n≥1).

Chapter 4

- page 192 — add the following sentence to the end of Definition 4.1.4: A language L is context-free if there exists a context-free grammar G so that L = L(G) (thanks to Kevin Lillis).
- page 201 — the last line should read: derivation A □ $□_1□_2$ … $□_k$ $□^*$ w …
- page 214 — the next to last line should read: obtaining (since both A $□^*$ B and A $□^*$ C) (thanks to Eduard Dragut).
- page 215 — the first line should read: Then we replace B □ C obtaining (since only B $□^*$ C) … (thanks to Eduard Dragut).
- page 220 — the first line of the proof of Theorem 4.4.4 should read: For G = (V,□,P,S), by Lemma 4.4.3 … (thanks to Nitin Chopra).
- page 228 — the last line of paragraph should read: production <term> □ <factor> (thanks to Eduard Dragut).
- page 238 — the last line should read: A□V will determine the set V_A = {Z□V | A $□^*$ Z}.

Chapter 5

- page 250 — in the middle of the proof of Theorem 5.1.1, item (iii) should read: (iii) □'(s,□,Y) = □(s,□,Y) □ {(e,□)} … (thanks to Kevin Lillis).
- page 260 — the next to last line of Example 5.2.3 should read: <0,a,0> is a dead symbol) … (thanks to Xiaoding Luo).
- page 267 — add ❑ at the bottom of the page to signify the end of the proof of Lemma 5.3.2.
- page 270 — in the table at the bottom of the page, the entry in row s_3, column (a,B) should be s_1/A, and this cell should be shaded (thanks to Jian Jia and Qingchuan Zang).
- page 277 — in problem 5.6(h), the language should read: $\{x_1x_2 \ldots x_pc^p$ | p≥1 and x_i□$\{a^kb^k$ | k≥1}, 1≤i≤p} (thanks to Mah-Lih Chen).

Chapter 6

• page 283 — The first line of the proof of Theorem 6.1.1 should read: Suppose that we have context-free languages L_1, L_2 □ □*. … (thanks to Nitin Chopra).

• page 284 — in the proof of Theorem 6.1.2, the transition function □ of PDA A' should be defined as follows: for each a□□□{□} and Y□□, (<p',q'>,□)□□(<p,q>,a,Y) if and only if (p',□)□□$_A$(p,a,Y) and q'□□$^*_B$(q,a) (thanks to Min Shi).

• page 297 — The first line of case 2 should read: Since len(vwx) ≤ n, in this case x□a*b*. … (thanks to Nitin Chopra).

• page 297 — The first line of case 3 should read: In this case x□b*c*, Then … (thanks to Nitin Chopra).

• page 305 — The program fragment in Figure 6.3.1 is missing a closing **end** at the end (thanks to Eduard Dragut).

• page 336 — Exercise 6.4 should refer to exercise 2.16 (thanks to Eduard Dragut).

• page 336 — Exercise 6.5 should refer to exercise 2.17 (thanks to Eduard Dragut).

Chapter 7

• page 349 —the third line of Example 7.1.2 should refer to Theorem 7.1.2 (thanks to Nitin Chopra).

• page 350 — In Example 7.1.3, in the second line of sample derivation (2), delete the repeated occurrence of a^3b^2CCBC (thanks to Eduard Dragut).

• page 353 — the third line of the proof of Theorem 7.1.3 should read: grammar G' = (V,□,P,S) … (thanks to Nitin Chopra).

• page 353 — the second line of the second paragraph of the proof of Theorem 7.1.3 should refer to Theorem 7.1.2 (thanks to Nitin Chopra).

• page 369 — Definition 7.2.6 should read: if G = (V,□,P,S) … (thanks to Jie Peng).

• page 377 — The proof of Theorem 7.3.1 should refer to exercises 7.10 and 7.11, not 7.6 and 7.7.

Chapter 8

• page 424 — in Definition 8.3.3, the third bullet should read:

  • k<1 or k>h, and □$_j$ = □$_i$ for all j≥i — …

• page 424 — in Definition 8.3.4, the last line should end with: … with an ID <h, f(x_1, x_2, … , x_n), … >.

- page 429 — the first line of the proof of Theorem 8.4.1 should refer to Theorem 7.2.2 (thanks to Jie Peng).
- page 429 — the first sentence of the second paragraph of the proof of Theorem 8.4.1 should read: Let T = (S, □, □, □, s_0, ***B***, R) … (thanks to Eduard Dragut).
- page 431 — the first line of the proof of Theorem 8.4.2 should refer to Theorem 7.2.3.
- page 431 — the first sentence of the second paragraph of the proof of Theorem 8..4.2 should read: Given a phrase structure grammar G = (V,□,P,S), the strategy is to (thanks to Eduard Dragut).
- page 431 — the first line of the third bullet in the proof of Theorem 8.4.2 should read: if not, find all strings d_{k_1+1}, d $_{k_1+2}$, … , d $_{k_2}$ derivable from some d_i, 2≤i.
- page 435 — line eight should read: a $_{k+1}$tba$_{k-1}$ … a $_2$a$_1$# ….
- page 437 — in the third line replace compliment by complement (thanks to Eduard Dragut).
- page 437 — the second line of the last paragraph should read: recognizable, then neither …
- page 438 — Definition 8.4.1 should refer to Theorem 8.4.7 (thanks to Eduard Dragut).
- page 438 — Definition 8.4.2 should begin: for □ = {0,1} … (thanks to Jie Peng).
- page 439 — the beginning of the second line of the third paragraph should read: □(s_1,1) = <s_2,0,**R**> …
- page 439 — in the third paragraph on this page the description of the Turing machine recognizing the language 1(0+1)* should be:111010010010100111; propagate this change throughout the paragraph (thanks to Paula Kelly).
- page 447 — in Problem 8.19, part (b) should be marked as having a solution, not part (a) (thanks to Jie Peng).

Chapter 9

- page 452 — in Figure 9.1.2, the label for the leftmost symbol should read: starting square of **U.**
- page 461 — the first line should read: or not we even have something we should refer to as a “language.
- page 489 — in problem 9.27, the definition for 'useful' should require □,□□(V□□)* (thanks to Kevin Lillis).

- page 470 — in the second paragraph, third line form the end should have: T= (S,□,□,□,0,***B***,R) (thanks to Eduard Dragut).
- page 476 — the fifth line of the proof of Corollary 9.3.5 should read: {□} and L(G_2) – {□} … (thanks to Eduard Dragut).

Appendix: Sample Solutions

- page 491 — in the solution for problem 1.3(e), the regular expression for all sequences with an even number of '1's should be 0* (1 0*1 0*)*, and the regular expression for all sequences with an odd number of '1's should be 0* (1 0*1 0*)* 1 0*; an alternate solution for an odd number of '1's is (0 + 1 0* 1)* 1 0* (thanks to Kevin Lillis).
- page 512 — the solution to Problem 7.2(b) should read: This string is derived by S □ aSA □ aaBA □ aabBc □ $a^2b^2c^2$ (thanks to Eduard Dragut).
- page 512 — the first line of the second paragraph of the solution for Problem 7.4(f) should read: So by the context-free rules, S $\overset{*}{□}$ $0^n SX^n$ □ … (thanks to Jie Peng).
- page 519 — Problem 8.19(a) is actually a solution for Problem 8.19(b) (thanks to Jie Peng).
- page 521 — The last paragraph of the solution for Problem 9.16 should read as follows. This occurs if and only if A □ yB and A □ y'C, where y = y'w for w□□*. Then z' = wz, B $\overset{*}{□}$ z, and C $\overset{*}{□}$ z'. So check all such production pairs (finitely many) to see if w L(B) □ L(C) ≠ ∅ (thanks to Jie Peng).