

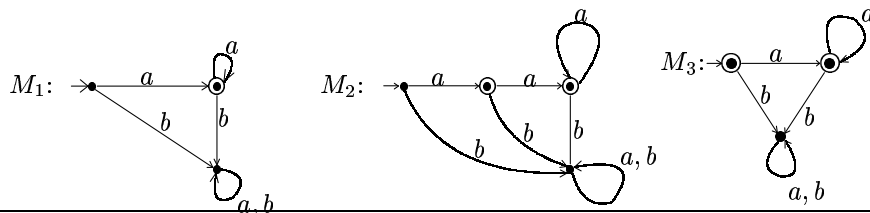
Automata and Formal Languages

Errata List—January 9, 2004

Page 27, line 5. Should read: $A \cap B = \{x \mid x \in A \text{ and } x \in B \text{ simulatneously} \}$

Page 27, line 11. $A \cap B = 1\{\varepsilon, 1\}$ should be $A \cap B = \{\varepsilon, 1\}$.

Page 47, The alphabet for the transition diagrams on this page should be $\Sigma = \{a, b\}$. The transition diagrams for M_1 , M_2 , and M_3 should be:

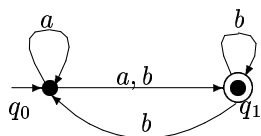


Page 50, middle of second to last paragraph. “quesswork” should be “guesswork”.

Page 52, second line of page. $\Delta(\{q_0, ab\})$ should be $\Delta(\{q_0\}, ab)$.

Page 52, exercise 2.5.3, “preceding technique” should be “techniques of this section”

Page 55, figure 2.25. Label the states as in the following diagram:



Page 59, Figure 2.32. Missing a transition from q_0 to q_5 labelled by a .

Page 62, Second paragraph after **Theorem 2.8.1**. Sentence missing. Insert the following after the first sentence:

Assume that M has no ε -transitions.

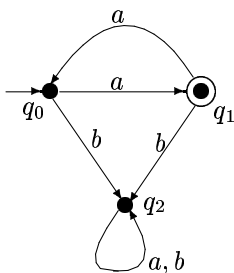
Page 63, second to last line of proof of **Theorem 2.8.2**. “contracts” should be “contradicts.”

Page 63, line missing from bottom of page:

$$A_4 = \varepsilon \cup bA_4.$$

Page 65, exercise 2.8.12, replace the word “languages” by the word “language.”

Page 66, exercise 2.8.13 figure 2.47. The states should be labelled as follows:



Page 68, Seventh line of page. "... such string of length $n + 1$ in $L(M)$." should say "... such string of length at least $n + 1$ in $L(M)$."

Page 69, statement of Theorem 2.9.2 should read "Let M be a deterministic finite automaton with k states."

Page 82, 3 lines before beginning of exercise 2, should say $f^{-1}(L_2) = ((a \cup c)b \cup (a \cup c))^*$.

Page 82, near the bottom of the page the expressions for $f^{-1}(a^n b a^n)$ and $f^{-1}(L)$ are incorrect. They should be as follows: $f^{-1}(a^n b a^n) = \{ubv \mid u \in (a \cup c)^n \text{ and } v \in (a \cup c)^{n-1}\}$ and $f^{-1}(L) = \{ubv \mid \exists n \geq 1 \text{ with } u \in (a \cup c)^n \text{ and } v \in (a \cup c)^{n-1}\}$.

Page 89, second line of part 1 of the description of the construction of the productions in P the word "transformations" should be "transitions."

Page 89, last line of the page should end with $= \{f\}$.

Page 91, exercise 3.2.5, remove the "?".

Page 93, the term "phrase-structured" appears at least 4 times on the page. It should be "phrase-structure."

Page 97, exercise 3.4.3 " $cfgS$ " should be " $cfg S$ " in the last line of the exercise.

Page 100, step 1 of Algorithm 3.5.2 contains the symbol Σ^* which should be Σ' .

Page 101, step 1 of Algorithm 3.5.3 should say "Initialize \mathcal{N} to contain all nonterminals A for which ..."

Page 101, the body of the Repeat loop in step 2 of algorithm 3.5.3 should say "If $B \rightarrow w$ is a production where $w \in \mathcal{N}^*$ (i.e., all symbols of w are in the current \mathcal{N}) then add B to \mathcal{N} ."

Page 105, third (from top of page) group of productions is missing two productions and has one production for S incorrect. The entire group should be presented as:

$$\begin{aligned} S &\rightarrow C_b A \mid C_a B \\ A &\rightarrow C_b D_1 \mid C_a S \mid a \\ D_1 &\rightarrow AA \\ B &\rightarrow C_a D_2 \mid C_b S \mid b \\ D_2 &\rightarrow BB \\ C_a &\rightarrow a \\ C_b &\rightarrow b \end{aligned}$$

Page 105, last paragraph before exercises should say:

If L is a context-free language that contains ε , then we may find a context-free grammar $G = \{\Sigma, N, S, P\}$ in Chomsky normal form for $L - \{\varepsilon\}$. Let S be the start symbol of G . From G create a new grammar G' which has nonterminals $N \cup \{S'\}$ where S' is a new symbol and productions $P \cup \{S' \rightarrow w \text{ whenever } S \rightarrow w \text{ is a production in } P\} \cup \{S' \rightarrow \varepsilon\}$. Let S' be the start symbol of G' . Note that G' is in Chomsky normal form except for the single ε -production $S' \rightarrow \varepsilon$.

Page 108, first paragraph of section 3.6. “exactly $2|w|$ steps” should be “exactly $2|w| - 1$ steps.”

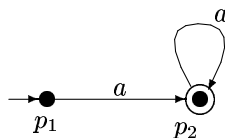
Page 112, table in Example 3.6.1. The rows (along the left side of the table) should be labelled with i 's not j 's.

Page 116, line 2, “is a symbol in $\Delta \cup \{\varepsilon\}$ ” should be “is a symbol in $\Sigma \cup \{\varepsilon\}$ ”

Page 116, heading of 4th column of the table at the bottom of the page. “ (a, b) ” should be “ (a, B) ”

Page 116, 1st row of table at bottom of the page. Entry in the first column is missing a “}”.

Page 119, the transition diagram for the finite automaton of the example is in error. It should look like this:



Page 123, second line of fifth (from the top of the page) paragraph “... and some $\tau \in \Gamma \cup \{\varepsilon\}$.” should say “... and some $\tau \in \Sigma \cup \{\varepsilon\}$.”

Page 131, third paragraph (from top of page) second line, replace “sides” by “side”. In third line replace “we will get” by “we may get”

Page 132, second collection of productions on the page is missing the following productions: $Z \rightarrow A_2 A_2 \mid A_2 A_2 Z$.

Page 134, first line of page “By exercise 2, there...” should be “By part 2, there...”

Page 143, line 10, the definition of M should include b . That is,

$$M = (\{q_1, q_2, q_3, q_4, q_5\}, \{a, b\}, \{a, b, c, d, \bar{b}\}, q_1, \bar{b}, \{q_5\}, \delta_0)$$

Page 154, first line of second paragraph of section 4.4 the Turing machine referred to $(L_{\bar{T}})$ is from section 4.3.

Page 155, first line of the page, the Turing machine referred to $(L_{\bar{T}})$ is from section 4.3.

Page 159, the description of the simulated move of a multidimensional Turing machine is incorrect. The move should change the contents of the current cell and *then* compute and move.

Page 167, line 5, "...on *all* inputs that accept L ." should be "...on *all* inputs that accepts L ."

Page 167, last line of exercise 5.1.1 "...for any string w i decides..." should be "...for any string w T decides..."

Page 168, middle of the page. The transition $\delta(q', (\bar{b}, \bar{b})) = (q_1, (\bar{b}, z), (S, S))$ should be $\delta(q', (b, \bar{b})) = (q_1, (b, z), (S, S))$.

Page 168, seventh line from the bottom of the page, "...toward the bottom of the stack,..." should be "...toward the bottom of the stack after blanking the cell corresponding to the current top of stack,..."

Page 168, the transitions in lines 4 and 5 from the bottom of the page should be

$$\begin{aligned}\delta(q_1, (b, a)) &= (q_2, (b, \bar{b}), (R, L)) \\ \delta(q_2, (b, a)) &= (q_2, (b, \bar{b}), (R, L))\end{aligned}$$

Page 168, last line of the page, the transition should be $\delta(q_2, (\bar{b}, z)) = (q_2, (\bar{b}, b), (S, L))$.

Page 173 in the fifth line of paragraph 4 of the proof of theorem 5.3.3, "...we might include in M ..." should be "...we would include in M ..."

Page 173, first line of the last paragraph on the page, "The proof of Theorem 5.3.3 suggests..." should be "The proof of Theorem 5.3.3, sketched above, suggests..."

Page 176, in definition 5.4.1 the term *phrase-structured grammar* should be *phrase-structure grammar*.

Page 179, the production $\bar{b}q_1 \rightarrow q_1\bar{b}$ should be $\bar{b}q_2 \rightarrow q_1\bar{b}$.

Page 193, in the statement of exercise 6.1.2, w_m should be w_M in all cases.

Page 196, the middle block of text on the page ends with the partial sentence, "That is, we must have a" It should read, "That is, we must have a solution that looks like the following: "

Page 196, the second to last equality on the page has an incorrect subscript on one of the b symbols. b_{1_n} should be $b_{1_{n_1}}$.

Page 196, the last sentence of the proof of Lemma 6.2.1 begins “Ignoring the $\$$ signs, ...” It should begin “Ignoring the $\$$ and $\%$ signs, ...”.

Page 199, block 20 appears in the solution in the lower middle part of the page. The symbols in the top of that block are incorrect. They should be q_3a .

Page 206, second paragraph (from top of page) the definition of the grammar G should have $\Sigma \cup C$ in place of Σ .

Page 207, third line of the proof of Theorem 6.3.4, “By Lemma 3.3...” should be “By Lemma 6.3.3...”.

Page 207, second to last line of proof of Theorem 6.3.4, “ $L(G) = \Sigma^*$ ” should be $L(G) = (\Gamma \cup Q \cup \{\$\})^*$.

Page 215, second line on the page, the term “ $NSPACE$ ” should be “ $NPSPACE$.”

Page 234, in the index. The definition of Griebach normal form appears on page 130, not page 133 as indicated.

Page 236, in index. add Ogden, W., 133. Change “Phrase-structured grammar” to “Phrase-structure grammar.”

Please send additions to this list to dean.kelley@mnsu.edu. Thanks.