

Errata, CS_236 Language and Computation, Michaelmas Term 2009

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1: Introduction

- Slide 4: Replace “Taksi” by “Taksi”.

2.1: Grammars for Defining Syntax

- Slide 9: Replace in 1. u_n by u_m . Add in the definition of uv a comma between u_m and v_1 .
- Slide 31: B, C, H are as well nonterminals, and c is as well a terminal. Add them in the definition of the grammar as a tuple

$$G^{a^n b^n c^n} = (\{a, b, c\}, \{S, B, C, H\}, S, \dots)$$

modify the line starting with terminals to

terminals a, b, c

and the line starting with nonterminals to

nonterminals S, B, C, H

- Slide 50: Replace $Program \longrightarrow Id := Aexp$ by $Program \longrightarrow Id := AExp$.
- Slide 51: Replace $Id := Identifier$ by $Id := AExp$.
- Slide 57: replace in

$$\langle BExp \rangle ::= \langle BExp \rangle BOp2 \langle BExp \rangle$$

$BOp2$ by $\langle BOp2 \rangle$ to obtain

$$\langle BExp \rangle ::= \langle BExp \rangle \langle BOp2 \rangle \langle BExp \rangle$$

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2.2: The Chomsky Hierarchy and Regular Languages

- Slide 7: Definition, 3.: Replace “Type 4” by “Type 3”.
- Slide 8, Remark: replace the last “regular” by “unrestricted”, so it should read:
 $L \text{ regular} \Rightarrow L \text{ context-free} \Rightarrow L \text{ context-sensitive} \Rightarrow L \text{ unrestricted}$.

2.3: Finite State Automata

- Slide 24: Replace in the last line “ $\delta^*(q, w) = \bigcup_{i=1}^n \delta^*(q_i, w)$ ” by “ $\delta^*(q, w) = \bigcup_{i=1}^n \delta^*(q_i, w')$ ” (i.e. replace last occurrence of w by w').
- Slide 32: The transitions refer to the wrong alphabet and the resulting states need to be put into $\{\dots\}$:
So the transitions should be:
transitions $\delta(q_0, 1) = \{q_1\}$
 $\delta(q_0, 2) = \{q_2\}$,
 $\delta(q_0, 3) = \{q_3\}$.
- Slide 76: State S should be marked as start state.
- Slide 77: State S should be marked as start state.
- Slide 120: Replace in line 2 “Then there exist a fixed number k ” by “Then there exist a fixed number n ”
- Slide 122: Replace all occurrences of the variable k by n .
- Slide 124: Replace all occurrences of the variable k by n .

2.4: Derivation Trees for Context Free Grammars

- Slide 32: Replace “A tree with root w ” by “A forest with root w ”.
- Slide 33: There should have been 2 parts of the lemma, denoted by (1) and (2). They got lost. The lemma should read as follows:
Lemma
Let $G = (T, N, S, P)$ be a CFG, $w \in (T \cup N)^+$, $w' \in T^*$.
(1) Assume there are two different derivation forests with root w and frontier w' . Then there exist two different left-most and two different right-most derivations of $w \Rightarrow^* w'$.
(2) Assume there are two different left-most derivations or two different right-most-derivations of $w \Rightarrow^* w'$. Then there exist two different derivation forests of with root w and frontier w' .
- Slide 34, Theorem. Replace in (1) the word root by label.
- Slide 35 - 37: Replace in the headline (1) \Rightarrow (2) by (1).

- Slide 38: Replace in the headline $(2) \Rightarrow (1)$ by (2) .
- Slide 42: Replace $Program \longrightarrow Id := Aexp$ by $Program \longrightarrow Id := AExp$.
- Slide 49, 52, 116, 118: Same correction.
- Slide 51/52: The grammar used is ambiguous (Why?). The grammar should read as follows:

$$\begin{array}{ll}
 Program & \longrightarrow UnmatchedIf \\
 Program & \longrightarrow MatchedIf \\
 MatchedIf & \longrightarrow Id := Aexp \\
 MatchedIf & \longrightarrow \mathbf{if} BExp \mathbf{then} MatchedIf \\
 & \qquad \qquad \qquad \mathbf{else} MatchedIf \\
 UnmatchedIf & \longrightarrow \mathbf{if} BExp \mathbf{then} Program \\
 UnmatchedIf & \longrightarrow \mathbf{if} BExp \mathbf{then} MatchedIf \\
 & \qquad \qquad \qquad \mathbf{else} UnmatchedIf
 \end{array}$$

Now modify on Slide 51 in the third bullet:

- MatchedIf. They match **if_then_else_**, and both the if-clause and else-clause can only be instantiated by a MatchedIf.
 - UnmatchedIf. They match **if_then_**, and an **if_then_else_** with a matched if and an unmatched else clause.
- Slide 53: s_1, s_2 need to belong to *MatchedIf*, so replace the *Program* above it by *MatchedIf*.

IV.2: The URM

- Slide 20: Add in the row for R_0 after I_0 the value 2 (as it is used for I_1).
- Slide 22, line 1: Replace U-program by URM-program.

IV.3: The Turing Machine

- Slide 36: Replace $(01010)_2 = 12$ by $(01010)_2 = 10$.
- Slide 84: Note that χ_M was introduced on slide 77. There we used the notation \vec{x} , which stands for x_1, \dots, x_n .
- Slide 96: Replace “We will define below a computable function $f : \mathbb{N} \xrightarrow{\sim} \mathbb{N}$, s.t. $f \neq \{e\}$ ” by “We will define below a computable function $f : \mathbb{N} \xrightarrow{\sim} \mathbb{N}$, s.t. for all $e \in \mathbb{N}$ we have $f \neq \{e\}$.”