

# Errata, CS\_336/CS\_M36 (part 2)/CS\_M46: Interactive Theorem Proving, Lent Term 2006

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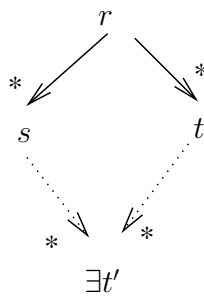
Here follows a list of errata in the script Interactive Theorem Proving, CS\_336/CS\_M36 (part 2)/CS\_M46. All mistakes have been corrected in the lecture notes available on the Internet.

## 2: Reduction Systems and Term Rewriting

- Slide 2-6: The bracketing in the third formula of the reduction of  $S(S Z) + S(S Z)$  was not correct. It should read

$$\begin{aligned} S(S Z) + S(S Z) &\longrightarrow S(S(S Z) + S Z) \\ &\longrightarrow S(S(S(S Z) + Z)) \\ &\longrightarrow S(S(S(S Z))) \end{aligned}$$

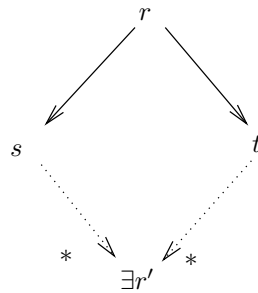
- Slide 2-61: In the diagram the line from  $t$  to  $t'$  should be a dotted arrow, as the arrow from  $s$  to  $t'$ :



- Slide 2-63: Second bullet: Replace  $t \longrightarrow^* t$  by  $r \longrightarrow^* r'$ . In the diagram, the arrows from  $s$  to  $r'$  and  $t$  to  $r'$  should be dotted:

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### 3: The $\lambda$ -Calculus and Implication

- Slide 3-55: 4th bullet (don't confuse it with 3rd bullet which is similar): Replace “or  $x : o2, y : o3$ , and therefore  $x y : o2$ .” by “or  $x : o3, y : o2$ , and therefore  $x y : o2$ .”
- Slide 3-61: Replace in the first displayed formula the type  $o \rightarrow o$  by  $o \rightarrow o \rightarrow o$ . So that line should read

$$y : o \rightarrow o \rightarrow o \Rightarrow \lambda x^o . y x : o \rightarrow o \rightarrow o$$

- Slide 3-61: In the second displayed formula, the type is missing. It should read:

$$y : o \rightarrow o \rightarrow o, x : o \Rightarrow y x : o \rightarrow o$$

- Slide 3-64: Again in the first displayed formula, the type  $o \rightarrow o$  should be replaced by  $o \rightarrow o \rightarrow o$ . So that line should read

$$y : o \rightarrow o \rightarrow o \Rightarrow \lambda x^o . y x : o \rightarrow o \rightarrow o$$

- Slide 3-66: Again in the first displayed formula, the type  $o \rightarrow o$  should be replaced by  $o \rightarrow o \rightarrow o$ . So that line should read

$$y : o \rightarrow o \rightarrow o \Rightarrow \lambda x^o . y x : o \rightarrow o \rightarrow o$$

- Slide 3-79: Last formula. The square brackets should be replaced by round brackets:

$$b :: B ((\lambda(x :: A) \rightarrow x) a) .$$

- Slide 3-83: Replace  $g := \lambda x : A . x : A \rightarrow A$  by  $g := (\lambda x : A . x) : A \rightarrow A$  (addition of brackets).

## 4: The $\lambda$ -calculus with products and conjunction

- Slide 4.4: Omit “possibly” in the following:

- “Assume we have a type Term of terms, possibly representing functions

$$\text{Int} \rightarrow \text{Int} .$$

so it should read

- “Assume we have a type Term of terms, representing functions

$$\text{Int} \rightarrow \text{Int} .$$

- Slide 4-95: Replace in the first displayed formula

$$\text{case}_{\text{true}} : \sigma \quad \text{case}_{\text{false}} : \sigma$$

by

$$\text{case}_{\text{tt}} : \sigma \quad \text{case}_{\text{ff}} : \sigma$$

Furthermore, replace in the last line

$$\text{Case}_{\text{Bool}}^{\sigma} \text{case}_{\text{ff}} \text{case}_{\text{ff}} \text{ff} = \text{case}_{\text{ff}}$$

by

$$\text{Case}_{\text{Bool}}^{\sigma} \text{case}_{\text{tt}} \text{case}_{\text{ff}} \text{ff} = \text{case}_{\text{ff}}$$

- Slide 4-96: Replace in the second orange formula in the beginning (they appear in the printed version in a pale colour)

$$\text{Case}_{\text{Bool}}^{\sigma} \text{case}_{\text{ff}} \text{case}_{\text{ff}} \text{ff} = \text{case}_{\text{ff}}$$

by

$$\text{Case}_{\text{Bool}}^{\sigma} \text{case}_{\text{tt}} \text{case}_{\text{ff}} \text{ff} = \text{case}_{\text{ff}}$$

- Slide 4-97: Replace in the third bullet  $\text{case}_{\text{true}}$  by  $\text{case}_{\text{tt}}$ , and  $\text{case}_{\text{false}}$  by  $\text{case}_{\text{ff}}$ , i.e. write

“Then it follows that, whenever  $\text{case}_{\text{tt}} : \sigma$  and  $\text{case}_{\text{ff}} : \sigma$ ,”

Furthermore, Replace in the last line

$$\text{Case}_{\text{Bool}}^{\sigma} \text{case}_{\text{ff}} \text{case}_{\text{ff}} \text{tt} \rightarrow \text{case}_{\text{ff}}$$

by

$$\text{Case}_{\text{Bool}}^{\sigma} \text{case}_{\text{tt}} \text{case}_{\text{ff}} \text{tt} \rightarrow \text{case}_{\text{ff}}$$

- Slide 4-105: Replace

$$\text{Case}_n^{\sigma} : \underbrace{\sigma \rightarrow \dots \rightarrow \sigma}_{n \text{ times}} \rightarrow \text{Bool} \rightarrow \sigma$$

by

$$\text{Case}_n^{\sigma} : \underbrace{\sigma \rightarrow \dots \rightarrow \sigma}_{n \text{ times}} \rightarrow \text{Fin}_n \rightarrow \sigma$$

- Slide 4-105: Replace true by tt, false by ff. So the last two formulae should be as follows:

$$\begin{aligned} \text{Eq}_{\text{n},\text{Bool}} A_n^i A_n^i &= \text{tt} \\ \text{Eq}_{\text{n},\text{Bool}} A_n^i A_n^j &= \text{ff} \quad \text{for } i \neq j \end{aligned}$$

- Slide 4-107: Replace

$$\text{Case}_{\text{Bool}}^\sigma := \text{Case}_{\text{Bool}}^\sigma : \sigma \rightarrow \sigma \rightarrow \text{Bool} \rightarrow \sigma$$

by

$$\text{Case}_{\text{Bool}}^\sigma := \text{Case}_2^\sigma : \sigma \rightarrow \sigma \rightarrow \text{Bool} \rightarrow \sigma$$

- Slide 4-145, second bullet point: Replace  
“In case  $b = \text{tt}$ , atom  $b$  should be false”  
by  
“In case  $b = \text{ff}$ , atom  $b$  should be false”

- Slide 4-146: Replace true by tt, and false by ff. To the last two lines should read:

$$\begin{aligned} \text{Eq}_{\text{n},\text{Bool}} A_n^i A_n^i &= \text{tt} \\ \text{Eq}_{\text{n},\text{Bool}} A_n^i A_n^j &= \text{ff} \quad \text{for } i \neq j \end{aligned}$$

- Slide 4-120: Insert a blank between data and Bool, i.e. replace

$$\begin{aligned} \text{data Bool} &= \text{tt} \mid \text{ff} \\ \text{data Bool1} &= \text{tt} \end{aligned}$$

by

$$\begin{aligned} \text{data Bool} &= \text{tt} \mid \text{ff} \\ \text{data Bool1} &= \text{tt} \end{aligned}$$

- Slide 4-147: Replace true by tt and false by ff.

So the case distinction reads as follows:

$$\begin{array}{lcl} \text{case } c \text{ of} & & \\ (\text{blue}) & \longrightarrow & \text{case } c' \text{ of} \\ & & (\text{blue}) \longrightarrow \text{tt} \\ & & (\text{red}) \longrightarrow \text{ff} \\ (\text{red}) & \longrightarrow & \text{case } c' \text{ of} \\ & & (\text{blue}) \longrightarrow \text{ff} \\ & & (\text{red}) \longrightarrow \text{tt} \end{array}$$

- Slide 4-150: In the last two formulae, replace atom (atom  $b$ ) by atom  $b$ . So the last bullet should read:

- We show

$$\text{atom} (\text{negbool } b) \rightarrow \neg(\text{atom } b)$$

which is in Agda

$$\text{atom} (\text{negbool } b) \rightarrow \text{atom } b \rightarrow \text{False}$$

## 5: The Logical Framework

- Slide 5-18: In the rule (Ass), replace the conclusion by  $\Gamma, x : A, \Delta \Rightarrow x : A$ . So this rule should read:

$$\frac{\Gamma, x : A, \Delta \Rightarrow \text{Context}}{\Gamma, x : A, \Delta \Rightarrow x : A} \text{ (Ass)}$$

- Slide 5-39: Replace the label (N-I<sub>nil</sub>) of the instruction rule for nil by (NatList-I<sub>nil</sub>). So the rule should be

$$\text{nil} : \text{NatList} \quad (\text{NatList-I}_{\text{nil}})$$

- Slide 5-144: Replace the label  $\times$ -I of the formation rule by  $\times$ -F.

## 6: Dat Types

- Slide 6-5: One needs to state before the definition of  $f$  that  $C := \lambda b^{\text{Bool}}.D$ .
- Slide 6-8: Replace in the second item  $\lambda b^{\text{Bool}}. \dots$  by  $\lambda b^{\text{Bool}}. \dots$ .  
(Note that in the online version, this slide will move to Slide 6-8a).
- Slide 6-27: Replace several times *case<sub>t</sub>true* by *case<sub>t</sub>ruebool*.