

Assignment 5: ADT's, Inductive Functions and SML

Ernesto Rodriguez

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1 Problem 4

My team will be represented by the following ADT, as specified on the instructions I will assume that my abstract data type contains the necessary declarations to represent \mathbb{N} as the natural numbers.

$$S^0 = \{\mathbb{N}, \textit{Position}, \textit{LastName}, \textit{Char}, \textit{Player}, \textit{Team}\}$$

$$\begin{aligned} \Sigma = \{ & [\textit{GK} : \textit{Position}], [\textit{MF} : \textit{Position}], \\ & [\textit{FW} : \textit{Position}], [\textit{DF} : \textit{Position}], \\ & [(a - z, A - Z) : \textit{Char}], [\$: \textit{LastName}], \\ & [++ : \textit{Char} * \textit{LastName} \mapsto \textit{LastName}], \\ & [\textit{Player} : \textit{LastName} * \mathbb{N} * \textit{Position} \mapsto \textit{Player}], \\ & [\textit{empty} : \textit{Team}], [\textit{add} : \textit{Player} * \textit{Team} \mapsto \textit{Team}], \\ & [\textit{sub} : \mathbb{N} * \textit{Player} * \textit{Team} \mapsto \textit{Team}] \} \end{aligned}$$

$$\textit{MyTeam} = \langle S^0, \Sigma \rangle$$

I will assume ++ is an infix function and I will use syntatic sugar to represent the LastName "G++O++M++E++Z++\$" as "GOMEZ". So my team in terms of add will be declared as follows:

$$\begin{aligned} \textit{myTeam} = & \textit{add}(\textit{Player}(\textit{"Yashin"}, 1, \textit{GK}), \\ & (\textit{add}(\textit{Player}(\textit{"Carlos"}, 6, \textit{DF})), \\ & (\textit{add}(\textit{Player}(\textit{"Maldini"}, 3, \textit{DF})), \\ & (\textit{add}(\textit{Player}(\textit{"Cafu"}, 2, \textit{DF})), \\ & (\textit{add}(\textit{Player}(\textit{"Hagi"}, 10, \textit{MF})), \\ & (\textit{add}(\textit{Player}(\textit{"Matthaus"}, 12, \textit{MF})), \\ & (\textit{add}(\textit{Player}(\textit{"Zidane"}, 5, \textit{MF})), \\ & (\textit{add}(\textit{Player}(\textit{"Beckham"}, 23, \textit{MF})), \\ & (\textit{add}(\textit{Player}(\textit{"Stoitchkov"}, 8, \textit{FW})), \\ & (\textit{add}(\textit{Player}(\textit{"Ronaldo"}, 9, \textit{FW})), \\ & (\textit{add}(\textit{Player}(\textit{"Pele"}, 11, \textit{FW})), \\ & (\textit{addempty})))))))))) \end{aligned}$$

Now this is how the substitutions would look like:

$$\begin{aligned} myNewTeam = & \textit{sub}(6, \textit{Player}(\textit{"Moore"}, 4, DF), \\ & \textit{sub}(6, \textit{Player}(\textit{"Thuram"}, 15, DF), \\ & \textit{sub}(3, \textit{Player}(\textit{"Figo"}, 7, MF), myTeam))) \end{aligned}$$