SyGuS Syntax for SyGuS-COMP'16

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Abstract. SyGuS-COMP'16 will consists of four tracks: the *general track* (GENERAL), the *conditional linear integer arithmetic track* (LIA), the *invariant synthesis track* (INV), and the *programming by examples track* (PBE). The latter is a track introduced in this year's competition. This document describes the syntax for this track. The syntax for the three other tracks is described in previous documents: GENERAL in [2] and LIA and INV in [3].

1 The Programming by Examples (PBE) Track

This track is aimed at synthesizing functions where all constraints are given by means of examples of what the result of the functions to be synthesized on certain inputs should be. The current supported logics for this track are either bit vectors (BV) or strings and linear integer arithmetic (SLIA).

Limitation on the constraints

All constraints in the PBE track should have equality at the root and the name of a function to be synthesized as the left argument.

Supported functions in SLIA

The supported string functions are defined below:

Functions with String Sort

```
(str.++ String String)
(str.replace String String String)
(str.at String Int)
(int.to.str String)
(str.substr String Int Int)
```

Functions with Int Sort

```
(str.len String)
(str.to.int String)
(str.indexof String String Int)
```

Functions with Bool Sort

```
(str.prefixof String String)
(str.suffixof String String)
(str.contains String String)
```

Example

The following is a legal SyGuS problem that can be used in the PBE track of SyGuS-COMP'16:

```
(set-logic SLIA)

(synth-fun f ((firstname String) (lastname String)) String
    ((Start String (ntString))
     (ntString String (firstname lastname " "
                       (str.++ ntString ntString)
                       (str.replace ntString ntString ntString)
                       (str.at ntString ntInt)
                       (int.to.str ntString)
                       (str.substr ntString ntInt ntInt)))
     (ntInt Int (0 1 2
                 (+ ntInt ntInt)
                 (- ntInt ntInt)
                 (str.len ntString)
                 (str.to.int ntString)
                 (str.indexof ntString ntString ntInt)))
     (ntBool Bool (true false
                   (str.prefixof ntSting ntString)
                   (str.suffixof ntString ntString)
                   (str.contains ntString ntString)))))

(declare-var name String)

(constraint (= (f "Nancy" "FreeHafer") "Nancy FreeHafer"))
(constraint (= (f "Andrew" "Cencici") "Andrew Cencici"))
(constraint (= (f "Jan" "Kotas") "Jan Kotas"))
(constraint (= (f "Mariya" "Sergienko") "Maria Sergienko"))

(check-synth)
```

The following is a valid implementation for the function `f` in this example:

```
(define-fun f ((first String) (last String)) String
              (str.++ (str.++ first " ") last))
```

References

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