DMFS - Problem Set 5

pwn274

March 2022

1 $a * (b|c)(d * |ef)*$

I parse this in natural language as three groups:

- 0 or more a's
- A single b or a single c
- 0 or more times of 0 or more d's or ef

1.1 defdefdef

This fails on the second item, as there is neither a b or a c after the 0 or more a's.

1.2 aaaac

This is legal, as there is 0 or more a's followed by a c followed by 0 of the last item

1.3 cdef

This is legal, as it has 0 a's, a c (the second item) after which it has two of the last item; a d and a ef

1.4 aaabcef

This fails as it has the second item twice after the a's.

1.5 aabddeeff

This fails, as the last eeff is illegal - the closest legal move would be efef

1.6 aabdddefefd

This is legal! A couple of a's, a single b, a run of d's and ef's.

2

2.1

S → aS (1a)
S → B (1b)
B → bcB (1c)
B →

Here, starting at S we can either write an 'a' to the left or go to B which will either terminate or write the two terminal characters 'bc' to the left. The empty string is thus included in the grammar which can be generated by:

$a*(bc)*$

2.2

S → aS (2a)
S → BS (2b)
S → B (2c)
B → bcB (2d)
B → (2e)

Once again the empty string is included in the grammar which will consist of consecutive a's or bc's:

$(a|(bc))*$

2.3

S → aS (3a)
S → BS (3b)
S → B (3c)
B → bBc (3d)
B → (3e)

This language is not regular because of rule 3d this can become ever-expanding (a fagterm is probably needed here)

3

3.1 Write a regular expression for the language consisting of all finite strings that do not contain any consecutive 0s.

I think this regular expression will catch all the strings:

$((0|1*)1)*$

This will generate 0 or more instances of either 01 or a run of 1's. Two 0's will thus never be adjacent to each other.

3.2

Write context free grammar for $\{(a \mid b)^n (c \mid d)^n \mid n \in \mathbb{N}\}$: What we want is to insert a's or b's on the 'left side' and equally many c's or d's on the right. There are probably smarter ways of doing this, but my initial idea is as follows:

$S \to A$

$A \to aAc$

$A \to aAd$

$A \to bAc$

$A \to bAd$

$A \to$

Where a, b, c, d are terminal and A is not. S is the starting point.