Jonny Hughes

Automata Theory

4-3-20

Homework #15

If L is a language, then let **half(L)** be the set of strings *w* such that there is some string *x*, $|x| = |w|$, $wx \in L$.

For L = { ε, 10, 100010, 001010, 001101, 010 }, **half(L)** = { ε, 1, 100, 001 }.

Note that odd-length strings in L have no corresponding value in half(L).

Demonstrate that context-free languages **are** or **are not** closed under this operation.

If we take a look at this context-free language L3 = {0a1b2c | 0 ≤ a ≤ b ≤ a+a }, which we have looked at in the past in proving that it is indeed a context-free language, It is clear that this language L3, to take half(L3) would require reliance on concatenation, which CFLs are closed under, but what makes it not work is the reliance on Subset which CFLS are not closed under. The reason it relies on subsets is that it first takes the subset of the language where the length of the strings are even, thus excluding odd length strings, making it no longer closed under the operation half().

Create a context-sensitive (or essentially noncontracting) grammar to describe the language

L = { *w* ∈ {0,1,2}* | #0(w) = #1(w) = #2(w) }

Use the sample grammar for { $0^n1^n2^n$ } for a starting point.

S → T | ε

T → 0TBC | 0BC

CB → BC

BC → CB

0B → 01 | B0

1B → 11 | B1

1C → 12 | C1

2C → 22 | C2