

Theory of Computation, CSCI 438 spring 2022

Decidability Problems Concerning Context-Free Languages, pg. 198-201, April 6

1. Acceptance problem for CFG.

$A_{CFG} = \{ \langle G, w \rangle \mid G \text{ is a CFG, } w \text{ is a string in the language of } G, \text{ and } w \in \mathcal{L}(G) \}$ decidable?

Is A_{CFG} decidable?

2. Empty CFG.

$E_{CFG} = \{ \langle G \rangle \mid G \text{ is a CFG whose language is empty} \}$

Is E_{CFG} decidable?

3. Equivalent CFGs

$EQ_{CFG} = \{ \langle G, F \rangle \mid G \text{ and } F \text{ are CFGs that generate the same language} \}$
decidable?

Is EQ_{CFG} decidable?

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4.3 Let $ALL_{DFA} = \{ \langle A \rangle \mid A \text{ is a DFA and } \mathcal{L}(A) = \Sigma^* \}$.

Show that ALL_{DFA} is decidable.

4.24 A **useless state** in a pushdown automaton is never entered on any input string. Consider the problem of determining whether a pushdown automaton has any useless states. Formulate this problem as a language and show that it is decidable.