Final sentential forms

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The recursively enumerable language family represents an important concept. Intuitively, it represents all of the algorithms that exist and some additional procedures. Every algorithm is guaranteed to terminate for every possible input, while procedures are allowed to cycle infinitely. Traditionally, this language family is represented by individual language models such as Turing machines or general grammars. It is also possible to represent this language family by a combination of less powerful models. In our case, we combine the context-free grammars and a single language $\{ww^R \mid w \in \{0,1\}^*\}$. The resulting model is called final sentential forms.

In short, final sentential forms are based on well-known context-free grammars. We are able to constrain the sentential forms of context-free grammar by a language, which we call final language. The finalization of sentential forms is done in the following way. We remove all of the occurrences of symbols from a subset of the total alphabet W. If the result of this removal belongs to the final language, we take its original sentential form and remove all of the occurrences of nonterminals from it. Such result contains only terminals and belongs to the language of the final sentential forms.

Firstly, the main result of the final sentential forms are presented. The most important result is that we are able to achieve equivalence with Turing machines using the final sentential forms of the context-free grammars and a single constant final language $\{ww^R \mid w \in \{0,1\}^*\}$. On the other hand, when regular language is used as final language, the resulting language is always context-free.

Both of the results are rigorously proven by formal proofs. The proof of the equivalence of final sentential forms and Turing machines utilizes simulation of the derivation in queue grammars, which are already known to be equivalent to the Turing machines. The second proof uses context-free grammar to simulate the final sentential forms with regular final language.