Algorithmic aspects of game theory. Homework 2

Deadline. 20 May by the end of the day.

Grading. **1 point**. Team work is accepted but the grade will be distributed among the authors.

In case of a team work, each author is asked to give a short description of her/his own contribution.

Solution may be written in English or in Polish.

Sub-word game

Let α be a non-empty word over a finite alphabet C. We consider a game over a finite colored arena (cf. lecture of 15 March)

$$G \quad = \quad \langle Pos_\exists, Pos_\forall, Move, C, rank, \mathbf{C}_\exists, \mathbf{C}_\forall \rangle,$$

where the winning objectives of Eve and Adam are, respectively,

$$\begin{array}{lcl} \mathbf{C}_\exists & = & \{v\,\alpha\,u : v \in C^*,\ u \in C^\omega\} \\ \mathbf{C}_\forall & = & C^\omega - \mathbf{C}_\exists. \end{array}$$

In words: Eve wins if the word α occurs in the game.

Tasks

1. Is it true that, whenever Eve has a winning strategy, she can use a *positional* winning strategy ?
2. Is it true that, whenever Adam has a winning strategy, he can use a *positional* winning strategy ?
3. Design an algorithm that, for a finite arena, decides the winner of each position, and estimate its complexity with respect to the size of an arena and the length of the word α.

Please note that the answer may depend essentially on α.