

T-79.5105
Answer Set Programming
The 1st Home Assignment
October 8, 2013

Autumn 2013

The **deadline** for this **home assignment**¹ is **October 18, 2013**.

Please upload your solution file(s) to our home assignments server at the following URL: <http://puzzle.ics.hut.fi/T-79.5105/>

A *directed graph* G is formally a pair $\langle N, E \rangle$ where N is a set of nodes and $E \subseteq N^2$ a set of edges, i.e., $\langle x, y \rangle \in E$ iff there is an edge $x \rightarrow y$ in G .

Given a directed graph $G = \langle N, E \rangle$, an *interesting set* is a subset $N' \subseteq N$ such that for every node in $N \setminus N'$ there is an edge leading from N' to it.

- a) Write an answer set program whose answer sets capture *interesting sets* for a directed graph $G = \langle N, E \rangle$ given as input. Your solution should meet the following criteria:
- An input predicate **edge**(\cdot, \cdot) is used to represent the input graph G . The maximum size of interesting sets is to be specified in terms of a constant k when invoking **gringo** (**-ck=...**).
 - An output predicate **member**(\cdot) is supposed to hold for the nodes of an interesting set N' satisfying $|N'| \leq k$.
 - In principle, your program should work for any finite input graph specified in terms of its edges, i.e., the predicate **edge**(\cdot, \cdot).

Submit your **gringo** encoding as your answer. Please comment away any optimization statements you may have used to solve items below.

- b) Find out the number n of interesting sets for the minimum value of k for which the given planar graph of 10 nodes still has interesting sets. Please provide the number n as your answer.
- c) Find a k -minimal interesting set for the given planar graph of 70 nodes. Submit the respective answer set as your answer.
- d) Find as small as possible interesting set for the given planar graph of 500 nodes. Again, return the corresponding answer set.

NOTE: This home assignment is **strictly personal** and you are supposed to work out your answers on your own.

¹<http://puzzle.ics.hut.fi/T-79.5105/students/336790/assignment1/a/assignment.pdf>