T-79.5105   **Autumn 2013**
Answer Set Programming
The 2nd Home Assignment
October 28, 2013

The **deadline** for this **home assignment**[1] is **November 15, 2013.**

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

Consider the following planning problem. The n-**bucket problem** involves n water buckets of potentially different capacities from 2 to 10 liters. There is only one operator $\mathsf{POUR}(i,j)$ available: it means that the contents of the bucket i is poured to the bucket j so that either (i) j becomes full of water or (ii) i becomes empty. Formalize this domain as an AI planning problem by writing down a logic program P in the input language of `gringo`.

a) Your solution should meet the following criteria:

   – An input predicate $\mathsf{init}(i,c,v,w)$ is used to represent the relevant parameters of the bucket number i where $1 \le i \le n$. The number c gives its total capacity in liters whereas the numbers v and w give the respective *initial* and *goal* amounts of water in it. Both v and w are integers in the range $0 \ldots c$.

   – Output predicates $\mathsf{src}(i,t)$ and $\mathsf{dst}(j,t)$ are assumed to hold for the buckets i and j involved in an operation $\mathsf{POUR}(i,j)$ taking place at time t. If no pour takes place at time t, then these predicates are false for all buckets i and j.

   In principle, your program should work for any set of buckets and any number of time steps (parameter $k \ge 0$ supplied to your program). Return your `gringo`-encoding as your answer to this part.

b) Find an optimal plan (one of the shortest plans) for the given 3-bucket problem, i.e., a sequence of pours that leads from the initial situation to the goal situation. Submit the respective answer set (restricted to input and output predicates) as your answer.

c) Find an optimal plan for the given 10-bucket problem. Return the corresponding answer set (projected on input and output predicates) as your answer.

d) Prove that the given 20-bucket problem is solvable by providing an answer set (restricted to input and output predicates) as your answer.

---

[1]`http://puzzle.ics.hut.fi/T-79.5105/students/336790/assignment2/a/` `assignment.pdf`

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