Verification

Please write the names of all group members on the solutions you hand in.

Uppaal

The tool Uppaal is available at `http://www.uppaal.org/`. You can also find documentation on the tool there.

Problem 1: Modeling with Uppaal

The Gear Production Stack (GPS) benchmark represents a manufacturing plant that consists of communicating processing stations. Whenever a gear is loaded into the plant, it gets processed by each station in a sequential manner. We check the bounded liveness property whether a gear is always processed within a certain time.

Assume you have a first station, where a gear is fed into the system.
The first station is activated by an external command (Hint: this command can be issued by your observer automaton). It then processes the gear for an amount of time between $minWorkTime$ and $maxWorkTime$.
When it finishes, it feeds the gear into the second station, which activates this station, which in turn processes the gear for an amount of time between $minWorkTime$ and $maxWorkTime$.
When it finishes, it feeds the gear into the third station, which activates this station and so on.
The last station just hands out the gear (Hint: this is observable).

Assume $minWorkTime = 2$ and $maxWorkTime = 3$, but keep your model parameterized.

(a) To model a plant with 3 stations, model each station as a timed automaton using Uppaal, creating a network of 3 stations and an observer automaton that checks that the overall production time of a gear is not greater than $3 * maxWorkTime$.

(b) Change your model to also verify that the gear is not handed out before $3 * minWorkTime$.

(c) Use Uppaal to model the plant *without using location invariants*, and verify both properties from Problem 1 (a) and (b).