

Implementation of DP^*

The DTMC model consists of six states that correspond to the six nodes of graph G^* . The states of the Markov chain modelled in PRISM language are defined by the values of variable `selected`. The transition probabilities between the states of the DTMC are formalized with the use of PRISM language commands. Each command defines the starting node in every step of the random walk and the probabilities of moving to a neighboring node. These probabilities coincide with the influence weights of each node's neighbors.

An example of the PRISM language's commands is presented in Listing 1. The command defines the probabilities of the random walk moving to nodes 1 or 3 when the starting node is 1.

```
[ ] selected = 1 -> 1/2: (selected ' = 1) +  
                    1/2: (selected ' = 3);
```

Listing 1: Example of DTMC command

The DTMC model incorporates a reward structure that corresponds to the opinions of the nodes. Since the random walk of our graph reaches each node in its infinite path with probability equal to the values of the stationary probability vector, the long-run reward of the random walk is comprised of the fragments that each node contributes in the formation of the consensus. The reward structure is presented in Listing 2.

```
rewards  
    selected = 1 : 0;  
    selected = 2 : 0.5;  
    selected = 3 : 0.5;  
    selected = 4 : 0.5;  
    selected = 5 : 0.5;  
    selected = 6 : 1;  
endrewards
```

Listing 2: Reward structure of DTMC

The extraction of the stationary probability vector π is achieved using the available functionality of PRISM, which allows the computation of the *steady state probabilities* of the DTMC. The evaluation of the consensus is achieved with the S operator for DTMCs. The S operator combined with the reward structure of the model is used to express the reward in the long run. The PCTL property

that expresses the long-run reward of the random walk (i.e., the consensus of the graph) is stated in Listing 3.

R=? [S]

Listing 3: PCTL expression of DTMC model