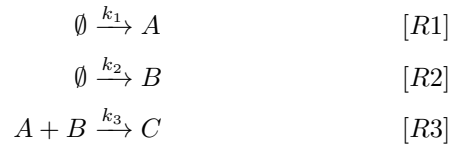


# Three-Reaction Example

## Model Description

A simple system of three species and three reactions. The species are  $A$ ,  $B$  and  $C$ . The reactions are:



This model is part of each of the provided PRISM model files.

## Properties

The property of interest is the probability to reach an *objective* state before a given time limit,  $T$ . The *objective* state is identified using a label in the PRISM model:

```
label "objective" = a=0 & b=0 & c=2;
```

Then, in PRISM syntax, the CSL property is given as  $P=? [F[0,T] \text{"objective"}]$ .

## Analysis

This model has infinite states (in principle) but the objective is unreachable if  $A > 2$  or  $B > 2$  or  $C > 2$ . This is visually clear in the state diagram:

The absorbing states are indicated using a `constraint` label in the PRISM model file:

```
label "constraint" = a+c<maxConstraint & b+c<maxConstraint;
```

The `constraint` is controlled by the `maxConstraint` constant. The lowest valid setting of `maxConstraint` is 3. The “constrained” importance sampling

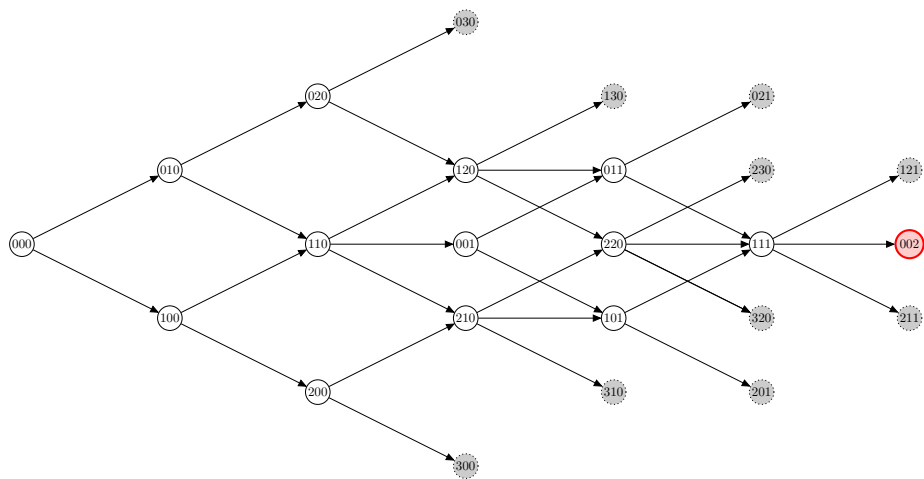


Figure 1: State diagram for the three-reaction model. The objective (red) is not achievable from the gray shaded states, so they are treated as absorbing states.

heuristic works by rejecting any transitions that violate the **constraint**. When **maxConstraint** is 3, all simulated paths reach the objective, which is optimum. When **maxConstraint** is greater than 3, simulated paths can terminate in absorbing states.