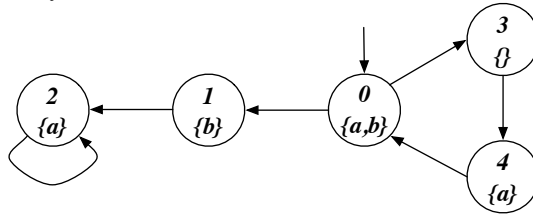
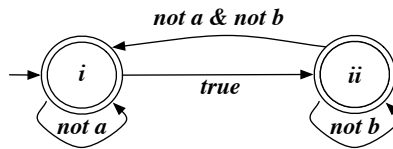


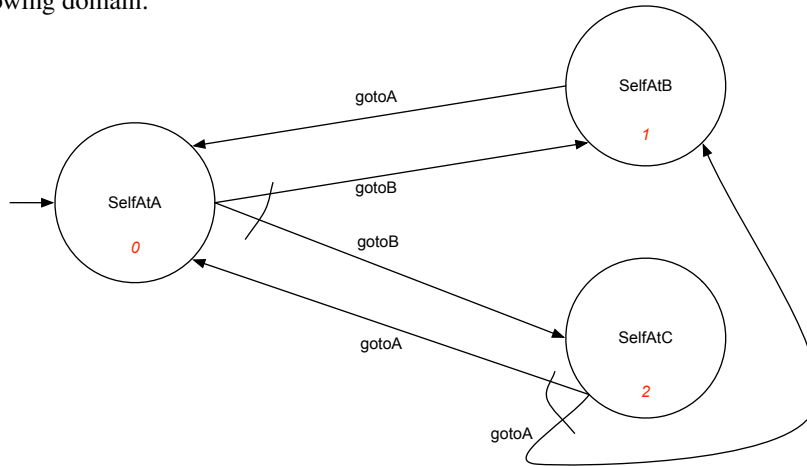
Part 1. Consider the following transition system:



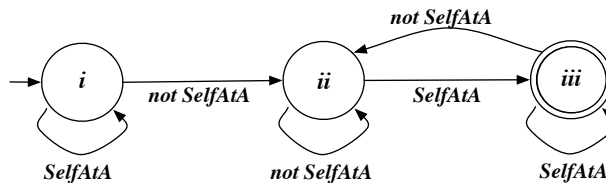
- **Exercise 1.1:** Model check the Mu-Calculus formula: $\nu X.\mu Y.((a \wedge \langle next \rangle X) \vee \langle next \rangle Y)$
- **Exercise 1.2:** Model check the CTL formula $AF(a \wedge AXb)$, by translating it in Mu-Calculus.
- **Exercise 1.3:** Model check the LTL formula $\diamond(a \wedge \bigcirc b)$, by considering that the Büchi automaton for $\neg \diamond(a \wedge \bigcirc b)$ is the one below:



Part 2 Consider the following domain:



- **Exercise 2.1:** Synthesize a strategy (a plan) for realizing the LTLf formula $\diamond(\neg \text{SelfAtA} \wedge \diamond(\text{SelfAtA} \wedge \bullet \text{false}))$, by considering that the corresponding DFA is the one below:



Part 3 Check whether the Hoare triple below is correct, by using $(x \geq 0 \wedge y \geq 0 \wedge x + y = 23)$ as invariant:

$$\{x = 23 \wedge y = 0\} \text{ while}(x > 0) \text{ do } (x = x - 1; y := y + 1) \{y = 23\}$$