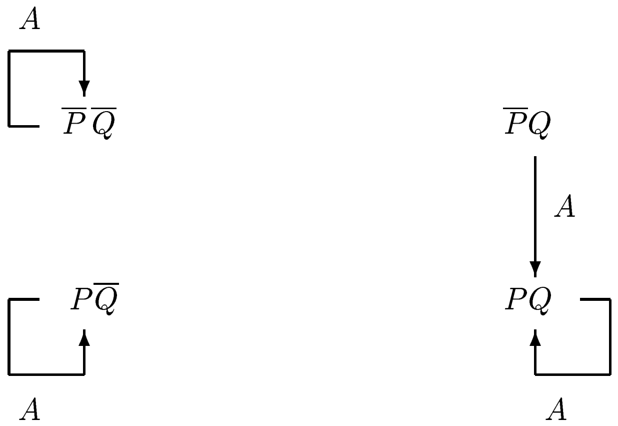
Action Language $\mathcal{A}$: Problems

Problem 10. According to *Action Languages* (p. 13), in action language $\mathcal{A}$ the proposition

$$A \textbf{ causes } P \textbf{ if } Q$$

describes the following transition system:



Prove this claim.

Problem 11. According to *Action Languages* (p. 4), any action described in $\mathcal{A}$ is deterministic. Prove this claim.

Problem 12. Consider the fluents *Loaded* (referring to a gun) and *Alive* (referring to a potential victim) and actions *Load* and *Shoot*. Both actions are always executable, but whether or not *Shoot* affects the value of *Alive* depends on the value of *Loaded*. Formalize this domain in $\mathcal{A}$ and draw the corresponding transition system.

Problem 13. (a) Formalize the toggling domain (Problem 5) in $\mathcal{A}$. (b) Formalize the following enhancement of this domain: there are two lightswitches that can be toggled; the light in the room is on whenever both lightswitches are in the same position.

The following abbreviation is useful: For any action name A and any conjunction F of literals,

$$\textbf{nonexecutable } A \textbf{ if } F$$

stands for the pair of propositions

$$\begin{array}{l} A \ \textbf{causes} \ P \ \textbf{if} \ F, \\ A \ \textbf{causes} \ \neg P \ \textbf{if} \ F \end{array}$$

for some fixed fluent name P.

Problem 14. Formalize the door locking domain (Example 2) in $\mathcal{A}$.

Problem 15. Describe a general method for translating domain descriptions from STRIPS into $\mathcal{A}$.