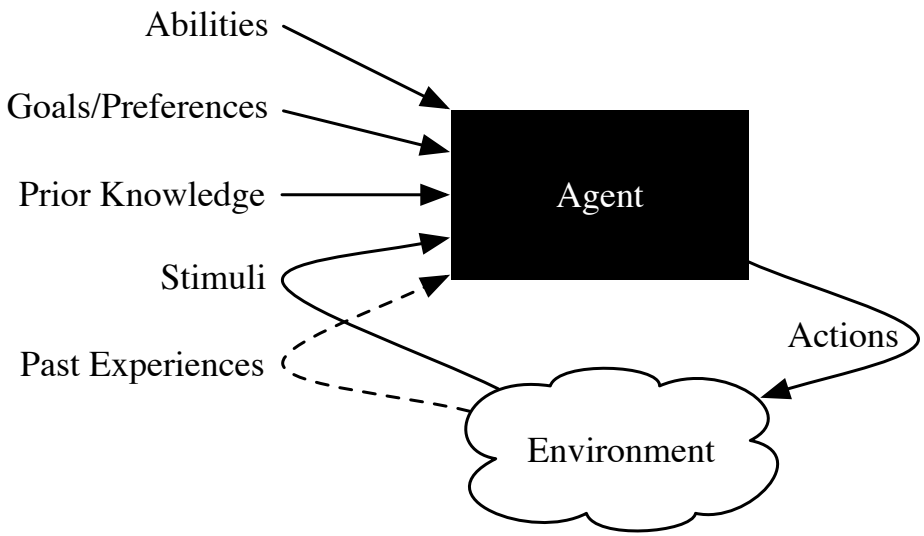
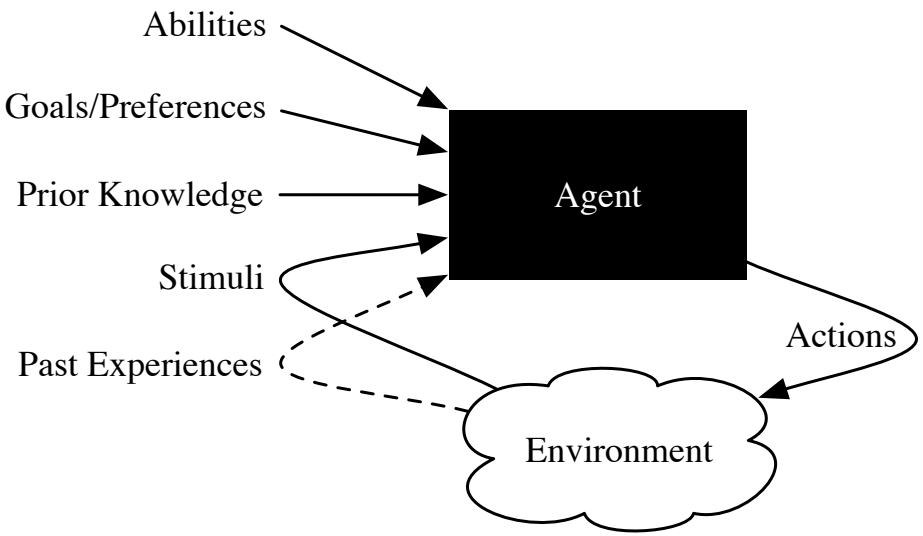

Abilities
Goals/Preferences
Prior Knowledge
Stimuli
Past Experiences
Agent
Actions
Environment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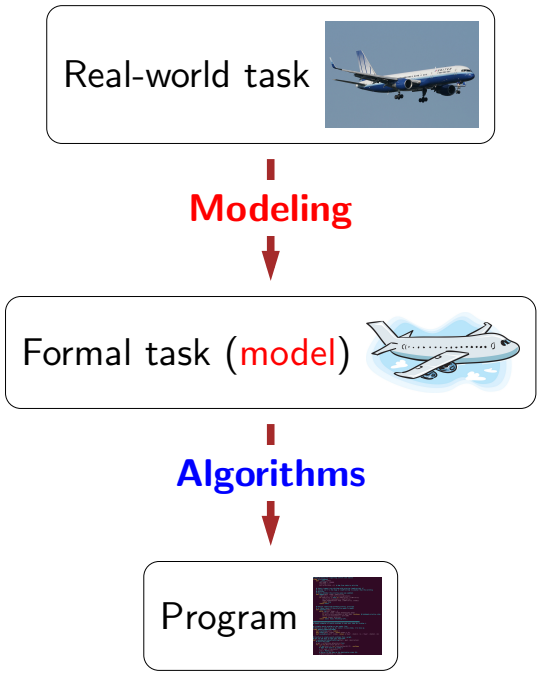
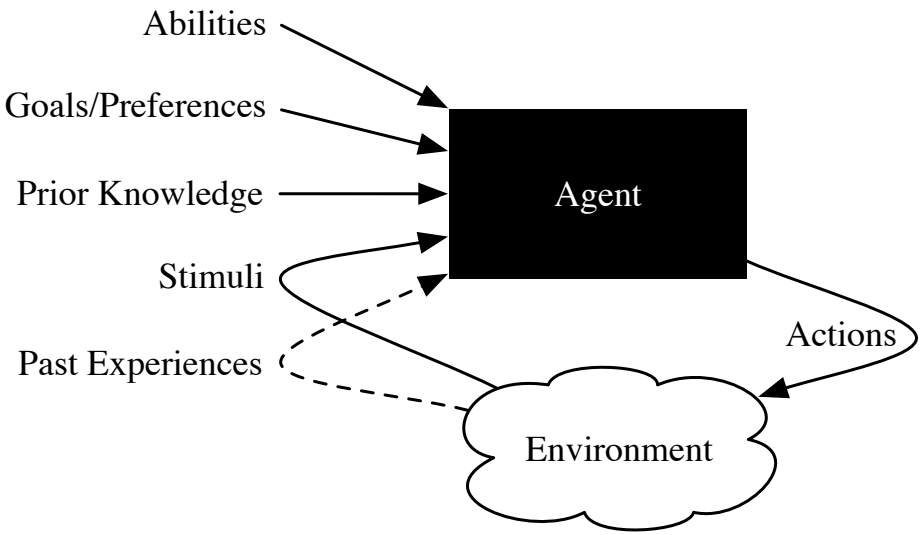
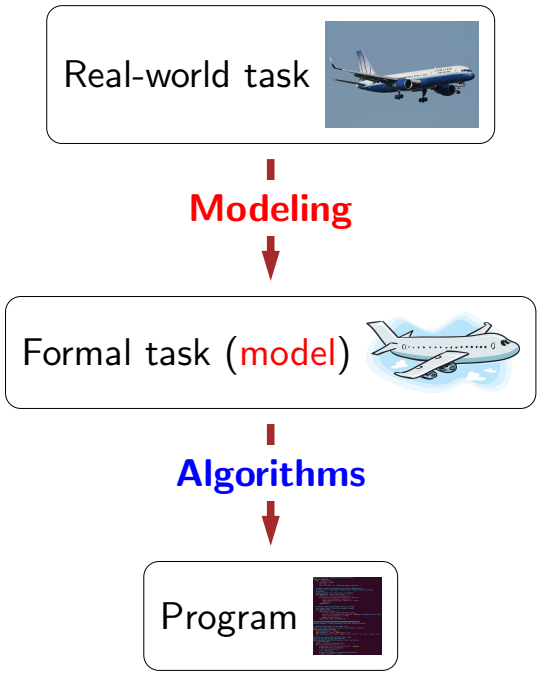
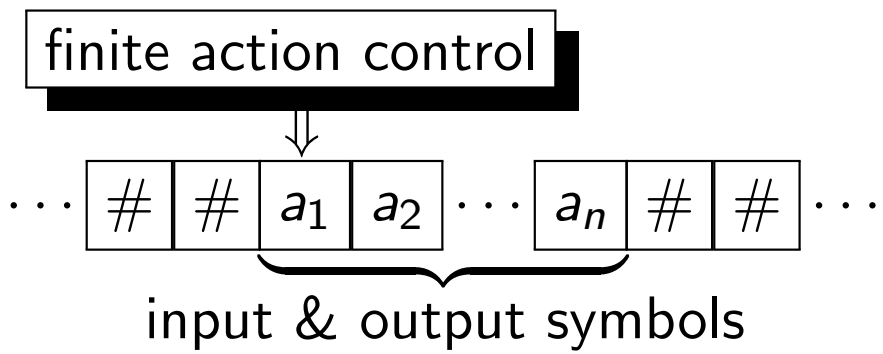

Real-world task
Modeling
Formal task (model)
Algorithms
Program

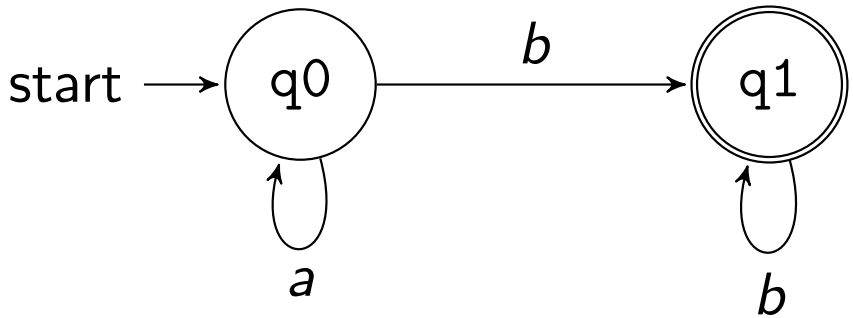




Church-Turing thesis: Program $\approx$ Turing machine



Finite state machine (fsm)



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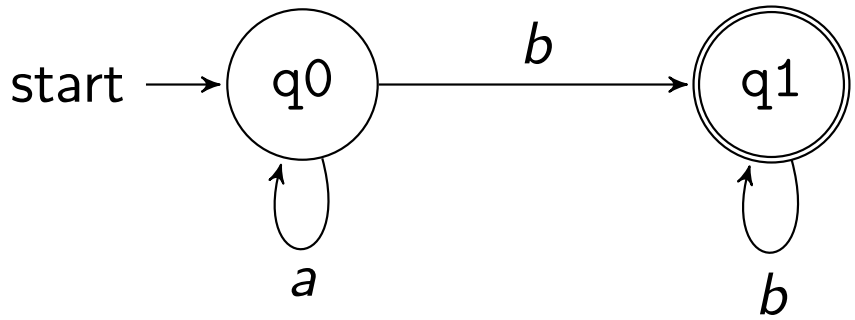

A **fsm** `M` is a triple `[Trans, Final, Q0]` where

- `Trans` is a list of triples `[Q,X,Qn]` such that `M` may, at state `Q` seeing symbol `X`, change state to `Qn`
- `Final` is a list of `M`'s final (i.e. accepting) states
- `Q0` is `M`'s initial state.

E.g.
```
Trans = [[q0,a,q0],[q0,b,q1],[q1,b,q1]]
Final = [q1]
Q0 = q0
```

From strings to fsm's

Encode strings as lists; e.g. 102 as `[1,0,2]`.

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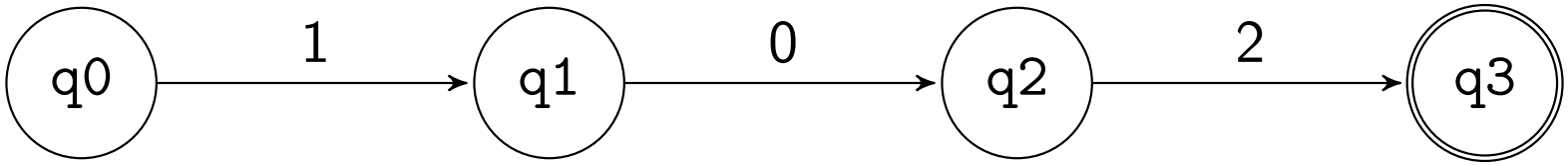

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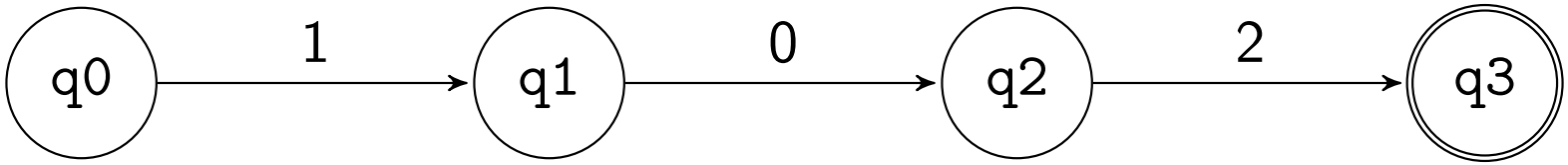


```
% string2fsm(+String, ?TransitionSet, ?FinalStates)
string2fsm([], [], [q0]).
string2fsm([H|T], Trans, [Last]) :-
            mkTL(T, [H], [[q0, H, [H]]], Trans, Last).
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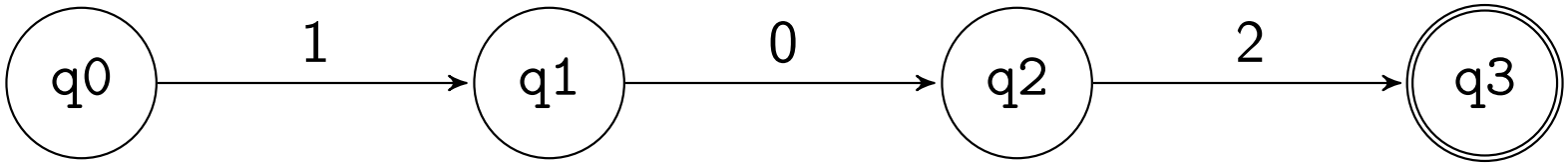


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% mkTL(+More, +LastSoFar, +TransSoFar, ?Trans, ?Last)
mkTL([], L, Trans, Trans, L).
mkTL([H|T], L, TransSoFar, Trans, Last) :-
     mkTL(T, [H|L], [[L,H,[H|L]]|TransSoFar],
          Trans, Last).
```

States as histories (in reverse)

Exercise

Define a 4-ary predicate

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accept(Trans,Final,Q0,String)
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that is true exactly when `[Trans,Final,Q0]` is a fsm that accepts `String` (encoded as a list).

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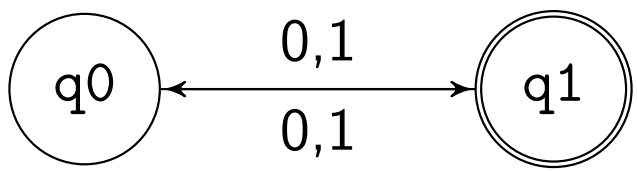
That is, write a Prolog program to answer queries such as

```
|?- accept([[q0,0,q1],[q0,1,q1],[q1,0,q0],[q1,1,q0]],
           [q1], q0, [1,0,0]).
yes
```



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```


```
test(String, Trans, Final) :-
                    string2fsm(String, Trans, Final),
                    accept(Trans, Final, q0, String).
```