

Overview

The following is an example of a classical planning problem given a STRIPS representation.

Note in the following solution the precondition list contains only positive fluents. Some STRIPS formulations have a separate positive and negative fluent precondition list. This solution avoids the need for a negated fluent precondition list.

Disjunctions are not allowed in any STRIPS list. If you need to have a disjunction in the preconditions, use multiple actions. This is a weakness of the STRIPS formulation.

Problem Description

Suppose we have a number of buckets and balls and we want to move the balls between the buckets using a robot arm. Balls may be either in a given bucket or held by the robot arm. The robot arm may hold only one ball and may only be at one bucket at a time. Formulate this as a STRIPS planning problem with the following actions:

- Picking up a ball
- Dropping a ball
- Moving the robot arm

STRIPS problem formulation

Fluents:

- Ball(X)**: Is X a ball?
- Bucket(X)**: Is X a bucket?
- In(X,Y)**: Is ball X in bucket Y?
- At(X)**: Is the robot arm at bucket X?
- Holding(X)**: Is the robot arm holding ball X?
- Handfree()**: Is the robot arm free to pick up a ball?

Operators:

Pickup(X,Y): Pickup ball X from bucket Y

- Preconditions: **Ball(X)**, **Bucket(Y)**, **In(X,Y)**, **At(Y)**, **Handfree()**
- Add: **Holding(X)**
- Delete: **In(X,Y)**, **Handfree()**

Drop(X,Y) : Drop ball X into bucket Y

- Preconditions: **Ball(X)**, **Bucket(Y)**, **Holding(X)**, **At(Y)**
- Add: **In(X,Y)**, **Handfree()**
- Delete: **Holding(X)**

Move(X,Y): Move the robot arm from bucket X to bucket Y

- Preconditions: **Bucket(X)**, **Bucket(Y)**, **At(X)**
- Add: **At(Y)**
- Delete: **At(X)**

With typing

We can repeat the same problem, assuming that predicates and actions are typed. This enables us to remove the type checking fluents Ball and Bucket:

Fluents:

`In(Ball X, Bucket Y)`: Is X ball X in bucket Y?
`At(Bucket X)`: Is the robot arm at bucket X?
`Holding(Ball X)`: Is the robot arm holding ball X?
`Handfree()`: Is the robot arm free to pick up a ball?

Operators:

`Pickup(Ball X, Bucket Y)`: Pickup ball X from bucket Y

Preconditions: `In(X,Y), At(Y), Handfree()`
Add: `Holding(X)`
Delete: `In(X,Y), Handfree()`

`Drop(Ball X, Bucket Y)`: Drop ball X into bucket Y

Preconditions: `Holding(X), At(Y)`
Add: `In(X,Y), Handfree()`
Delete: `Holding(X)`

`Move(Bucket X, Bucket Y)`: Move the robot arm from bucket X to bucket Y

Preconditions: `At(X)`
Add: `At(Y)`
Delete: `At(X)`