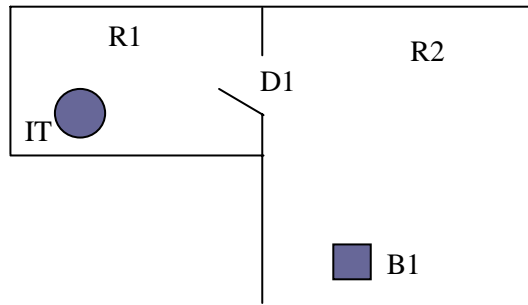


From *Introduction to AI Robotics* by R.R. Murphy, MIT Press, 2000

STRIPS is a variant of *means-ends analysis* which was used for planning

- Search backwards for pre-conditions until you find a valid action
- Given an initial state and a goal state, if the robot cannot reach the goal state in one action, then it picks an action that reduces the difference between the current state and the goal state.
- Facts are represented using predicate logic. Predicates are functions that evaluate to TRUE or FALSE. By convention, Predicates are written in uppercase; variables are written in lowercase.

EXAMPLE: Given the model shown, plan the steps required for the robot, IT, to move to the box, B1, and pick it up.



Predicates:

INROOM (x, r)

NEXTTO (x, t)

STATUS (d, s)

CONNECTS (d, rx, ry)

STATUSOBJ (x, s)

x is a moveable object; r is a room

x is a moveable object; t is a moveable object or a door

d is a door; s is OPEN or CLOSED

d is a door; rx and ry are rooms

x is a moveable object; s is GRASPED or REL

Initial State:

INROOM (IT, R1)

INROOM (B1, R2)

CONNECTS (D1, R1, R2)

CONNECTS (D1, R2, R1)

STATUS (D1, OPEN)

STATUS (B1, REL)

Goal State:

STATUSOBJ (B1, GRASPED)

INROOM (IT, R2)

INROOM (B1, R2)

CONNECTS (D1, R1, R2)

CONNECTS (D1, R2, R1)

STATUS (D1, OPEN)

Difference Table

Operator	Preconditions	Add-List	Delete-List
GOTODOOR (IT, d)	INROOM (IT, rx) CONNECTS (d, rx, ry)	NEXTTO (IT, d)	
GOTHRUDOOOR (IT, d)	NEXTTO (IT, d) CONNECTS (d, rx, ry) STATUS (d, OPEN) INROOM (IT, rx)	INROOM (IT, ry)	INROOM (IT, rx) NEXTTO (ROBOT, d)
GOTOOBJECT (IT, x)	INROOM (IT, r) INROOM (x, r) STATUSOBJ (x, REL)	NEXTTO (IT, x)	
PICKUP (IT, x)	NEXTTO (IT, x) INROOM (IT, r) INROOM (x, r) STATUSOBJ (x, REL)	STATUSOBJ (x, GRASPED)	STATUSOBJ (x, REL) NEXTTO (IT, x)

Recursive Planning

STEP 1:

In Add-List, finds: STATUSOBJ (B1, GRASPED)

Operator: PICKUP (IT, B1)

Preconditions not met: NEXTTO (IT, B1)
 INROOM (IT, R2)
 (IT and B1 are not in the same room)

STEP 2:

In Add-List, finds: NEXTTO (IT, B1)

Operator: GOTOBJECT (IT, B1)

Preconditions not met: INROOM (IT, R2)

STEP 3:

In Add-List, finds: INROOM (IT, R2)

Operator: GOTHRUDOOR (IT, D1)

Preconditions not met: NEXTTO (IT, D1)

STEP 4:

In Add-List, finds: NEXTTO (IT, D1)

Operator: GOTODOOR (IT, D1)

Preconditions not met: none

Execution:

Initial State	After GOTODOOR (IT, D1)	After GOTHRUDOOR (IT,D1)	After GOTOBJECT (IT, B1)	After PICKUP (IT, B1)
INROOM (IT, R1) INROOM (B1, R2) CONNECTS (D1, R1, R2) CONNECTS (D1, R2, R1) STATUS (D1, OPEN) STATUSOBJ (B1, REL)	INROOM (IT, R1) INROOM (B1, R2) CONNECTS (D1, R1, R2) CONNECTS (D1, R2, R1) STATUS (D1, OPEN) STATUSOBJ (B1, REL) NEXTTO (IT, D1)	INROOM (B1, R2) CONNECTS (D1, R1, R2) CONNECTS (D1, R2, R1) STATUS (D1, OPEN) STATUSOBJ (B1, REL) INROOM (IT, R2)	INROOM (B1, R2) CONNECTS (D1, R1, R2) CONNECTS (D1, R2, R1) STATUS (D1, OPEN) STATUSOBJ (B1, REL) INROOM (IT, R2) NEXTTO (IT, B1)	INROOM (B1, R2) CONNECTS (D1, R1, R2) CONNECTS (D1, R2, R1) STATUS (D1, OPEN) INROOM (IT, R2) STATUSOBJ (B1, GRASPED)