Planning as a CSP

- Search over planning horizons.
- For each planning horizon, create a CSP constraining possible actions and features
- Also factor actions into action features.

Action Features

- *PUC*: Boolean variable, the agent picks up coffee.
- *DelC*: Boolean variable, the agent delivers coffee.
- *PUM*: Boolean variable, the agent picks up mail.
- *DelM*: Boolean variable, the agent delivers mail.
- *Move*: variable with domain $\{mc, mac, nm\}$ specifies whether the agent moves clockwise, anti-clockwise or doesn't move

CSP Variables

Choose a planning horizon k.

- Create a variable for each state feature and each time from 0 to k.
- Create a variable for each action feature for each time in the range 0 to $k - 1$.

Constraints

- **state constraints** that are constraints between variables at the same time step.
- **precondition constraints** between state variables at time t and action variables at time t that specify constraints on what actions are available from a state.
- **effect constraints** between state variables at time t, action variables at time t and state variables at time $t + 1$.
- **action constraints** that specify which actions cannot co-occur. These are sometimes called mutual exclusion or mutex constraints.
- **initial state constraints** that are usually domain constraints on the initial state (at time 0).
- **goal constraints** that constrains the final state to be a state that satisfies the goals that are to be achieved.

CSP for Delivery Robot
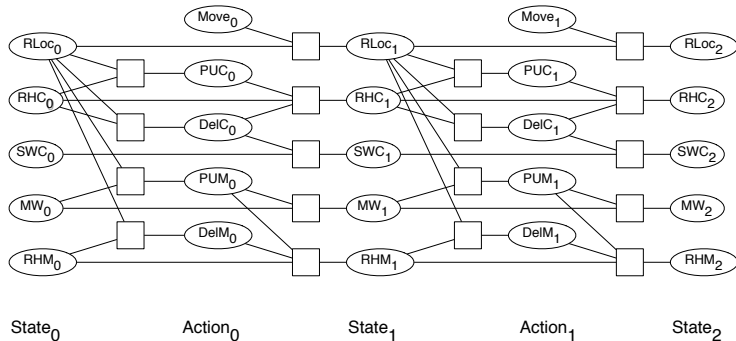
$RLoc_i$ — Rob's location
RHC_i — Rob has coffee
SWC_i — Sam wants coffee
MW_i — Mail is waiting
RHM_i — Rob has mail

$Move_i$ — Rob's move action
PUC_i — Rob picks up coffee
$DelC$ — Rob delivers coffee
PUM_i — Rob picks up mail
$DelM_i$ — Rob delivers mail

Effect Constraint

RHC_i	DC_i	PUC_i	RHC_{i+1}
true	true	true	true
true	true	false	false
true	false	true	true
true	false	false	true
false	true	true	true
false	true	false	false
false	false	true	true
false	false	false	false