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

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