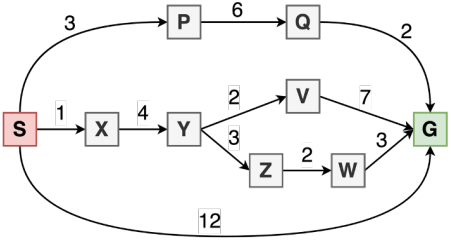
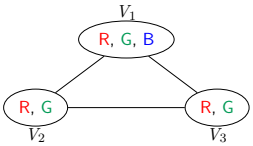
Exercise: BFS and UCS



Path finding from S to G

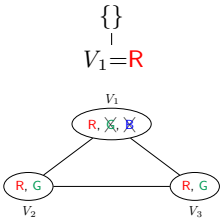
1. What is the solution using BFS?
   - A) S → X → Y → V → G *cost=14*
   - B) S → X → Y → Z → W → G *cost=13*
   - C) S → G ✓ *cost=12*
   - D) S → P → Q → G *cost=11*
2. Is BFS cost-optimal in this example? **No**
3. What is the solution using uniform-cost search (UCS)?
   - A) S → X → Y → V → G
   - B) S → X → Y → Z → W → G
   - C) S → G
   - D) S → P → Q → G ✓
4. Is uniform-cost search (UCS) cost-optimal? **Yes**

Backtracking with Forward Checking: Exercise

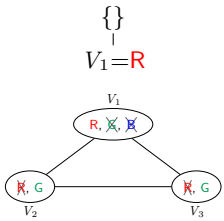


- Variables: $\mathcal{X} = \{V_1, V_2, V_3\}$.
- Domains: $\mathcal{D}_1$={R,G,B}, $\mathcal{D}_2$={R,G}, $\mathcal{D}_3$={R,G}.
- Constraints: adjacent variables must have different colors.

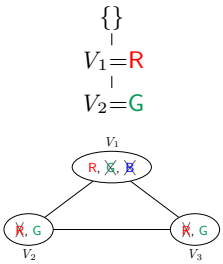
step 1: assign V_1=R



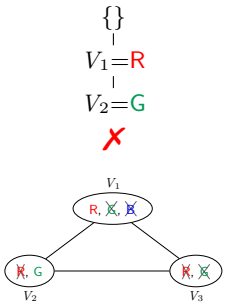
step 2: forward checking



step 3: assign V_2=G

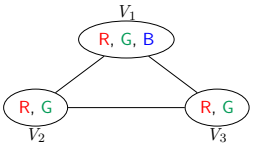


step 4: forward checking



$\mathcal{D}_3 = \varnothing$, terminate.

Backtracking with Forward Checking: Exercise



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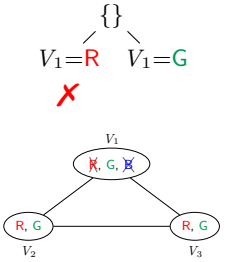
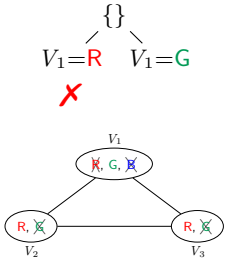
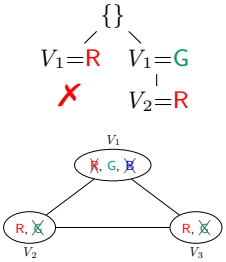
step 5: assign V_1=G



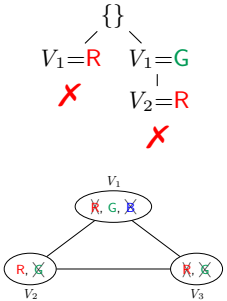
step 6: forward checking



step 7: assign V_1=G

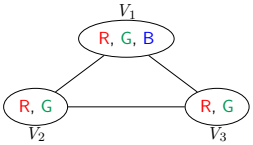


step 8: forward checking



$\mathcal{D}_3 = \varnothing$, terminate.

Backtracking with Forward Checking: Exercise



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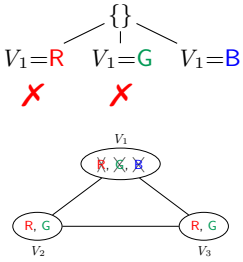
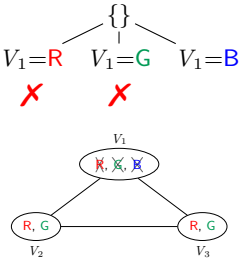
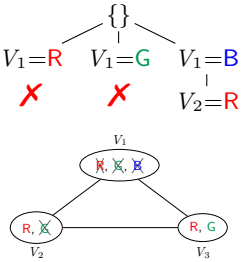
step 9: assign V_1=B



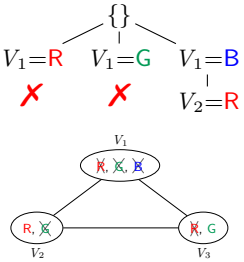
step 10: forward checking



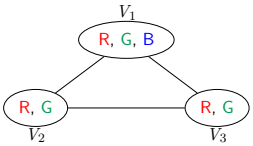
step 11: assign V_2=R



step 12: forward checking



Backtracking with Forward Checking: Exercise



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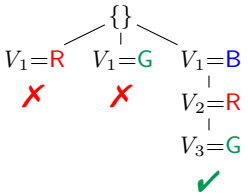
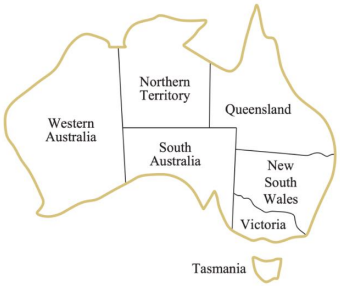
step 13: assign V_3=G

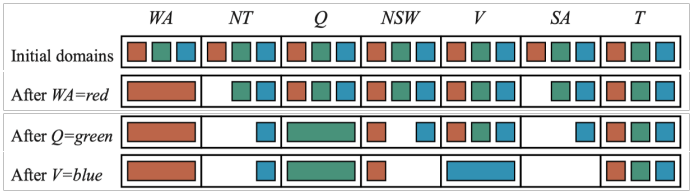


Solution found: { V_1:B, V_2:R, V_3:G}

Backtracking with Forward Checking: Exercise

In Australian map coloring problem, can we assign WA=red, Q=green, and V=blue? Apply forward checking and show the steps.





$\mathcal{D}_{SA} = \varnothing$, we cannot have such an assignment.