1 Explanation Generation

Algorithm 1: ExplainCSP($\mathcal{C}, f$)

$E \leftarrow \langle\rangle$;
$\mathcal{I}_{end} \leftarrow$ OptimalPropagate($\mathcal{C}$);
$I \leftarrow \emptyset$;
while $I \neq \mathcal{I}_{end}$ **do**
  $X \leftarrow$ bestStep($\mathcal{C}, f, I, \mathcal{I}_{end}$);
  $I_{best} \leftarrow I \cap X$;
  $\mathcal{C}_{best} \leftarrow \mathcal{C} \cap X$;
  $N_{best} \leftarrow \{\mathcal{I}_{end} \setminus I\} \cap$ OptimalPropagate(X);
  add $\{I_{best} \wedge \mathcal{C}_{best} \implies N_{best}\}$ to E;
  $I \leftarrow I \cup N_{best}$;
end
return E;

Algorithm 2: bestStep–OUS($\mathcal{C}, f, I, \mathcal{I}_{end}$)

$X_{best} \leftarrow \{\mathcal{C} \wedge I \wedge \overline{\mathcal{I}_{end}}\}$;
for $l \in \{\mathcal{I}_{end} \setminus I\}$ **do**
  $X \leftarrow \text{OUS}(\mathcal{C} \wedge I \wedge \neg l,\ f)$;
  if $f(X) < f(X_{best})$ **then**
    $X_{best} \leftarrow X$;
  end
end
return X_{best}

Algorithm 3: bestStep–c-OUS($\mathcal{C}, f, I, I_{end}$)

$\mathcal{G} \leftarrow \mathcal{C} \cup I_{end} \cup \overline{\mathcal{I}_{end}}$;
set p such that exactly one of $\overline{\mathcal{I}_{end}}$ in the hitting set *and* none of $\{I_{end} \setminus I\}$ *and* none of $\bar{I}$ can be in the hitting set;
return c-OUS($\mathcal{G}, f, p$);

2 OUS Algorithm

Algorithm 4: OUS-Inc($\mathcal{F}, f$)

SSOfF $\leftarrow \emptyset$
for $S \in$ **SSs** **do**
  $S_{\mathcal{F}} \leftarrow S \cap \mathcal{F}$
  if $\neg\exists S' \in$ **SSOfF** : $S_{\mathcal{F}} \subseteq S'$ **then**
    $S_{\mathcal{F}} \leftarrow$ Grow($S_{\mathcal{F}}, \mathcal{F}$)
    $\mathcal{H} \leftarrow \mathcal{H} \cup \{\mathcal{F} \setminus S_{\mathcal{F}}\}$
    SSOfF $\leftarrow$ **SSOfF** $\cup \{S_{\mathcal{F}}\}$
  end
end
while *true* **do**
  $\mathcal{F}' \leftarrow$ OptHittingSet($\mathcal{H}, f$)
  if $\neg$sat($\mathcal{F}'$) **then**
    return $\mathcal{F}'$
  end
  $\mathcal{F}'' \leftarrow$ Grow($\mathcal{F}', \mathcal{F}$)
  $\mathcal{H} \leftarrow \mathcal{H} \cup \{\mathcal{F} \setminus \mathcal{F}''\}$
  SSs $\leftarrow$ **SSs** $\cup \{(\mathcal{F}'', M)\}$
end

Algorithm 5: Postponing hitting set optimization for OUS (to be inserted before of)

while *true* **do**
  while $|\mathcal{H}| > 0$ **do**
    $\mathcal{F}' \leftarrow \mathcal{F}' + min_f$ element of last MCS in $\mathcal{H}$;
    if $\neg$sat($\mathcal{F}'$) **then**
      break
    end
    $\mathcal{H} \leftarrow \mathcal{H} \cup \{\mathcal{F} \setminus$ Grow($\mathcal{F}', \mathcal{F}$)$\}$;
  end
  $\mathcal{F}' \leftarrow$ GreedyHittingSet($\mathcal{H}, f$);
  if $\neg$sat($\mathcal{F}'$) **then**
    break
  end
  $\mathcal{H} \leftarrow \mathcal{H} \cup \{\mathcal{F} \setminus$ Grow($\mathcal{F}', \mathcal{F}$)$\}$;
end

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Algorithm 6: c-OUS($\mathcal{F}, f, p$)

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while true do
    F' ← CondOptHittingSet(H, f, p)
    if ¬sat(F') then
        return F'
    end
    F'' ← Grow(F', F)
    H ← H ∪ {F \ F''}
end
```