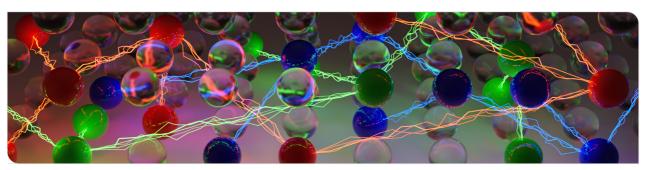




Practical SAT Solving

Exercise 1

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SLUR Formulas



Single Look-ahead Unit Resolution - SLUR algorithm

```
01 if \perp \in \text{UnitPropagation}(F) then return UNSAT else return SLUR(F)
02 function SLUR(F)
03
       if all variables appear in a unit clause then return SAT
      v = SelectVariable(F)
04
    F_1 = \text{UnitPropagation}(F \wedge (v))
05
     F_2 = \text{UnitPropagation}(F \wedge (\overline{v}))
06
07
      if \bot \in F_1 and \bot \in F_2 then return GIVE-UP
      if \bot \in F_1 and \bot \notin F_2 then return SLUR(F_2)
80
      if \bot \notin F_1 and \bot \in F_2 then return SLUR(F_1)
09
      if \bot \notin F_1 and \bot \notin F_2 then return SLUR(F_1) or SLUR(F_2)
10
```

A CNF formula F is SLUR if the SLUR algorithm never gives up on F (regardless of the choices in lines 04 and 10).





Algorithm 1: Single-lookahead Unit Resolution (SLUR)

```
1 if all variables appear in a unit clause then return SAT;

2 v \leftarrow SelectVariable(F);

3 F_1 \leftarrow UnitResolution(F \land (v));

4 F_2 \leftarrow UnitResolution(F \land (\overline{v}));

5 if \bot \in F_1 and \bot \in F_2 then

6 | return GIVE-UP;

7 if \bot \in F_1 and \bot \notin F_2 then

8 | return SLUR(F_2);

9 if \bot \notin F_1 and \bot \in F_2 then

10 | return SLUR(F_1);

11 return SLUR(F_1) or SLUR(F_2);
```

SLUR Formulas



Properties of SLUR Formulas [?]:

- Solvable in polynomial time (using the SLUR algorithm)
- SLUR is an umbrella class for polynomially solvable classes
 - All Horn and Hidden Horn formulas are SLUR formulas
 - Also true for Extended Horn, CC-balanced, and Propagation Complete formulas

SLUR Formulas



Properties of SLUR Formulas [?]:

- Solvable in polynomial time (using the SLUR algorithm)
- SLUR is an umbrella class for polynomially solvable classes
 - All Horn and Hidden Horn formulas are SLUR formulas
 - · Also true for Extended Horn, CC-balanced, and Propagation Complete formulas
- It is co-NP-complete to recognize whether a given CNF is a SLUR formula or not





