

Lipton's Method

$2^3 = 8$ single DNA strands

Each represents one truth assignment,
of

$$\boxed{x_1 \mid x_2 \mid x_3} \rightarrow 1$$

$$\boxed{x_1 \mid x_2 \mid \sim x_3} \rightarrow 2$$

$$\boxed{x_1 \mid \sim x_2 \mid x_3} \rightarrow 3$$

$$\boxed{\sim x_1 \mid x_2 \mid x_3} \rightarrow 4$$

$$\boxed{x_1 \mid \sim x_2 \mid \sim x_3} \rightarrow 5$$

$$\boxed{\sim x_1 \mid \sim x_2 \mid x_3} \rightarrow 6$$

$$\boxed{\sim x_1 \mid x_2 \mid \sim x_3} \rightarrow 7$$

$$\boxed{\sim x_1 \mid \sim x_2 \mid \sim x_3} \rightarrow 8$$

For each clause delete the truth assignment which does not satisfy the clause

For example: For clause 1, truth assignment 8 will be deleted.

3-SAT Example

Let the binary variables are: x_1, x_2 and x_3

clauses are: $(x_1 \vee x_2 \vee x_3) - 1$

$$(x_1 \vee x_2 \vee \sim x_3) - 2$$

$$(x_1 \vee \sim x_2 \vee x_3) - 3$$

$$(\sim x_1 \vee x_2 \vee x_3) - 4$$

$$(x_1 \vee \sim x_2 \vee \sim x_3) - 5$$

$$(\sim x_1 \vee \sim x_2 \vee x_3) - 6$$

$$(\sim x_1 \vee x_2 \vee \sim x_3) - 7$$

In DPLL method

If we assign $x_1 = T$, ~~#~~

it means the formula is changed to:

$$(x_2 \vee x_3)$$

$$(\sim x_2 \vee x_3)$$

$$(x_2 \vee \sim x_3)$$

Proposed method

Encoding the Formula

h | c | s | x₁ | \neg s | x₂ | \wedge s | x₃ | \vee s | c | s | x₁ | \wedge s | x₂ | \wedge s | \neg x₃ | \wedge s | c | s | x₁ | \vee s | \neg x₂ | \wedge s | x₃ | \vee s | c | s | \neg x₁ | \wedge s | x₂ | \wedge s | x₃ | \vee s | c | s | \neg x₁ | \wedge s | x₂ | \wedge s | \neg x₃ | \vee s | c | s

\neg x₁ | \wedge s | \neg x₂ | \wedge s | x₃ | \vee s | c | s | \neg x₁ | \wedge s | x₂ | \wedge s | \neg x₃ | \vee s | c | s | \neg x₃ | \vee s | c | s | \neg x₃ | \vee s | c | s

h = Formula Header

c | s = clause separator

x_i = Literal

\wedge s = Literal Separator

\vee s = Formula Tail

t | \wedge s = Truth assignment Separator

Let $x_1 = T$

so power ~~of~~ x_1 \wedge s and

\neg t | \wedge s | \neg x₁ | \vee s | c | s | x₁ | \vee s | c | s

h | c | s | x₁ | \wedge s | x₂ | \wedge s | x₃ | \vee s | c | s | x₁ | \wedge s | x₂ | \wedge s | \neg x₃ | \vee s | c | s | x₁ | \vee s | \neg x₂ | \wedge s | x₃ | \vee s | c | s | \neg x₁ | \wedge s | x₂ | \wedge s | \neg x₃ | \vee s | c | s | \neg x₃ | \vee s | c | s | \neg x₃ | \vee s | c | s

x₁ | \wedge s | \neg x₁ | \vee s | c | s | \neg x₁ | \wedge s | x₂ | \wedge s | x₃ | \vee s | c | s | \neg x₁ | \wedge s | x₂ | \wedge s | \neg x₃ | \vee s | c | s | \neg x₃ | \vee s | c | s | \neg x₃ | \vee s | c | s

