Lab Assignment 8: CS2233

6th November, 2023

A `boolean` formula is called `CNF` (conjunctive normal form) if it is represented via `conjunction` (`boolean-AND`) of several clauses such that each clause is a `disjunction` (`boolean-OR`) of literals (variables or negation of variables). Following is an example of the CNF formula

$$(x_1 \vee \neg x_2 \vee x_3) \wedge (\neg x_1 \vee \neg x_3) \wedge (x_4 \vee x_5 \vee \neg x_2 \vee x_1).$$

Further, a `boolean` formula is called `2-CNF` if each clause consists of exactly two literals.

$$(x_1 \vee \neg x_2) \wedge (\neg x_1 \vee \neg x_3) \wedge (\neg x_2 \vee x_1).$$

A `boolean` formula is called `satisfiable` if there exists an assignment of the boolean variables that makes the formula evaluate to `True`.

Problem statement: Suppose a `2-CNF` formula over n variables and m clauses is given as input, write a program that determines whether the formula is `satisfiable` or not. If the formula is `satisfiable`, then output the assignments of the variables that satisfy the formula. The running time of the algorithm should be $O(m + n)$.

Hint: `2-CNF` is in `P`.