

Assignment 3: Proving NP-Completeness

CS 5100/6100 – Foundations of Computer Science

March 11, 2013

Deadline: Monday, Mar 25, 2013 in class.

Puzzle. You are given a collection of cards (see Figure 1) and a card stand with three pegs (see Figure 2). Because of the stand pegs and the notches in the cards, each card will fit on the stand in either of two ways. Furthermore, each card contains two columns of holes, some of which may not be punched out. The puzzle is solved by placing all the cards on the stand so as to completely cover the stand (i.e., every hole position is blocked by at least one card that has no hole there). Let

$\text{PUZZLE} = \{(c_1, \dots, c_k) \text{ such that each } c_i \text{ is a card and this collection has a solution}\}.$

Assignment. Prove that PUZZLE is NP-complete. Hand in a complete pen-and-paper proof that I can read and understand.

Hints. Encode from 3SAT. Think about how you would match clauses and variables to cards and holes.



Figure 1: Collection of Cards. Notice that each card has 3 notches.

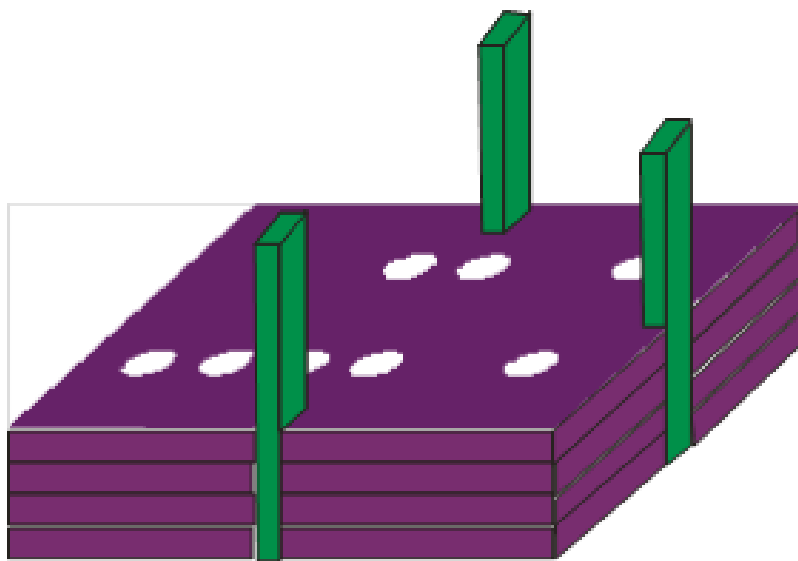


Figure 2: Card Stand with 3 Pegs.