Nov 20, sun midnight pdf

1) Graph isomorphism — with interaction how to solve?

Input: G_1, G_2 (two undirected graph)

Output: If these two are structurally the same (isomorphism) then yes, else NO

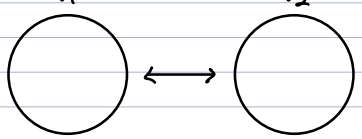
we had graph non-isomorphism problem

two programs $P_1 \leftrightarrow P_2$

1) Answer

input G_1, G_2 → two undirected graph

Output: If these two are structurally the same then yes, else NO



How to tell these two are isomorphism

P_1 → can compute and computable problem

P_2 → person. (lesser computing power)

big resource (better computing skills)

$P_1 \longleftrightarrow P_2$

2) Comparison of Resources

→ From the perspective of Algorithms.

- time
- space
- Random bits
- Interaction

} Similarities, differences

Ex)

time
space
→ DP
time ↔ space related

2) Answer

From the perspective of Dynamic programming

Time and space are the tradeoff relation, by using bottom-up with a table it saves time, but uses space.

In the similar case, merge sort copy the list from Array input and rearrange to save runtime.

In Quicksort,
by using Random bits (Randomized - Quicksort) to limit the average runtime $O(n \lg n)$

With the interaction of two object this resources can help the lesser resources (lesser computing power) to achieve the program by using other computer to get some hint to solve the problem.

for example, a coloring problem P_1 and P_2 (better computing skill), by keep asking the questions to P_2 repeat it many times to reduce the possibility to get wrong answer to run the Algorithm.

3) Sudoku : $n^2 \times n^2$ (row, column), $n \geq 2$ $\{1, 2, 3, 4\}$ A

Rule:

	1		3
2			
			3

(1) each row - at most once

(2) each column - "

(3) each block - has to be with all numbers

Input: a 4×4 grid where Every Entry is filled with $\{1, 2, 3, 4\}$

Ex) Random filled

1	2	2	4
3	4	1	1
2	4	3	4
1	3	2	1

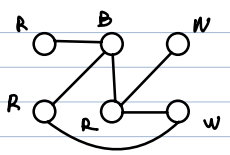
output: yes if this satisfy Rule, else no

a parameter

K-colors Graph Coloring Problem ($K \geq 3$) B

input: undirected graph

output: yes if any two adjacent nodes are colored differently
else no



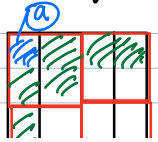
input K=3
{R, G, B}

Yes possible

It is possible to transform A into problem B) Chapter 34, 26

2) Answer

From the question A

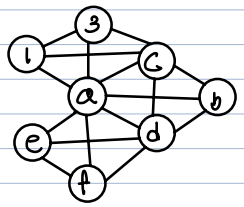


if a's number is determined, then all the given blocks cannot be the same number as a,

(e) if we choose an arbitrary a, in the prospect of problem B, all the green blocks are adjacent to block (a)

a	b	e	f
c	d	g	H
1	2	5	6
3	4	7	8

if I label each block boxes like this I can graph an undirected graph



this turns into problem B which can be n^2-colors graph coloring problem.

So it is possible to transform A into problem B.