



HW6 Group E: The Colors Project

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Introduction

Objective: Determine if a given undirected graph can be colored using k colors such that no two adjacent vertices share the same color.

Project Steps:

1. Encode Graph Input to Variables
2. Create Propositional Logic from Variables
3. Decode Solution from SAT Solver
4. Create a UI with Vue.js



Project Structure

Backend

- ▶ Implemented in Python
- ▶ Handles encoding of the graph coloring problem into SAT

Frontend

- ▶ Developed using Vue.js
- ▶ Allows user interaction and visualization of the graphs' coloring



Main functions

- ▶ Function `read_graph`: Reads the graph structure from a file
- ▶ Function `gen_vars`: Generates variables for each node-color combination
- ▶ Function `generate_constraint`: Creates the clauses for the SAT solver
- ▶ Function `decode_solution`: Parses the SAT solver's output



Core Propositional Logic

Three clauses:

- ▶ each node is assigned at least one color

$$(P_{i1} \vee P_{i2} \vee \dots \vee P_{ik})$$

- ▶ each node is assigned no more than one color

$$(\neg P_{i1} \vee \neg P_{i2}), (\neg P_{i1} \vee \neg P_{i3}), \dots, (\neg P_{i(k-1)} \vee \neg P_{ik})$$

- ▶ adjacent nodes have different colors

$$(\neg P_{i1} \vee \neg P_{j1}), (\neg P_{i2} \vee \neg P_{j2}), \dots, (\neg P_{ik} \vee \neg P_{jk})$$

User Interface

Number of Nodes:

6

Edges (format: source-target, e.g., 1-2; 2-3):

1-5; 4-5; 4-6; 3-2; 5-2; 1-2; 3-4; 5-3; 3-1; 5-6;

Number of Colors:

4

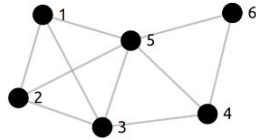
Or File Upload:

File TXT input:

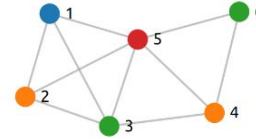
Choose File

No file chosen

Resolve Sat Problem



satisfiable





DEMO TIME



THANK YOU!