Polynomial Reductions

Assignment 3

Francisco Palomo Lozano

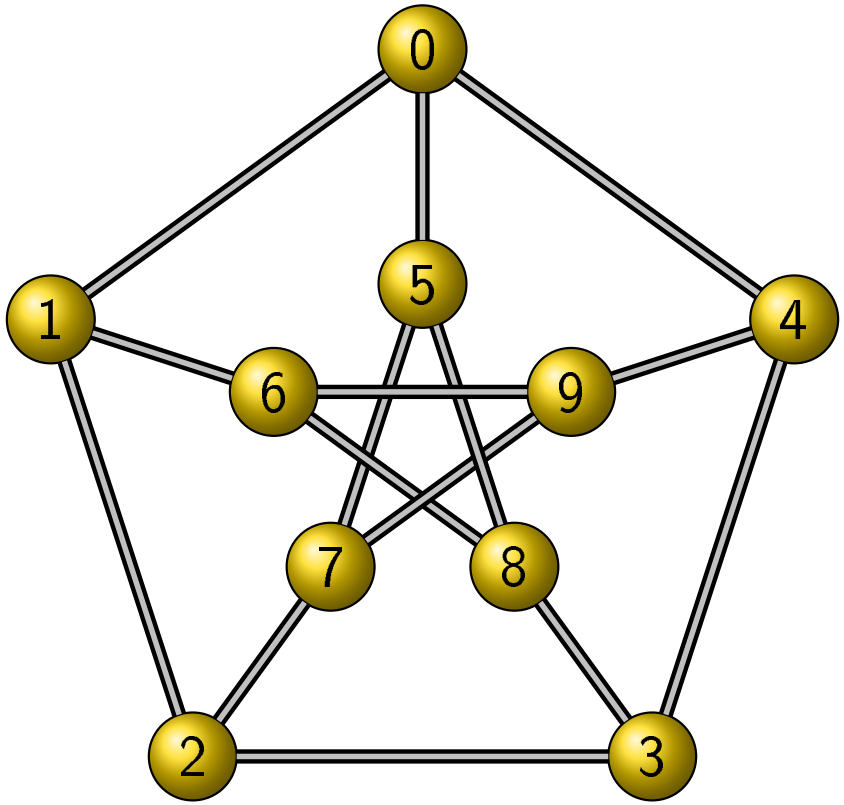
francisco.palomo@uca.es

Computational Complexity

Department of Computer Science

Universidad de Cádiz

The Petersen graph



Coloring the Petersen graph

1. The Petersen graph can be easily colored with four colors
2. Can it be colored with just three colors?
3. What about two?
4. We can answer these questions by a reduction to SAT

Reducing 3COL to SAT

1. Learn about the DIMACS format for SAT CNF problems
2. Write a program to reduce instances of 3COL to SAT
   - Use an adjacency list format for input
   - Use the DIMACS format for output
3. Which kind of reduction is obtained?
4. Use PicoSAT to determine if the Petersen graph is 3-colorable
5. If so, find two different colorings

Cliques and colors

1. Which is the clique number of the Petersen graph?
2. Which is its chromatic number?
   - Hint: you can reduce 2COL to SAT too
3. Could it have contained a clique of size four?
   - Why is this or not possible?
   - Which is the relation between colors and cliques?