

COMP 102A 2014, Assignment 4

Due Thursday December 4th 2014



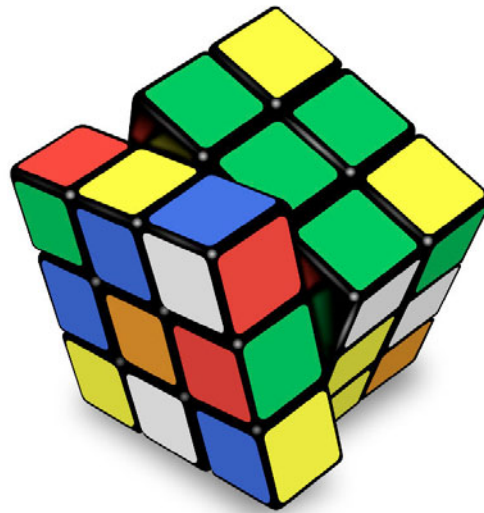
Consider this picture taken from a publicly available web page. I challenge you to find a path in the World Wide Web graph, starting from the course home page

<http://crypto.cs.mcgill.ca/~crepeau/COMP102/>

until you find the page that contains this picture. You may use any sneaky trick you find to solve this problem. Use your judgement to improve your search...

[100%]

1. Tell me what path you have found. Use the terminology of graphs to answer this question. What are the nodes of the graph that you visited ? What are the edges you used ? Please list all the nodes and edges you have visited or used.
2. Describe as precisely as possible the strategy you used to get to the desired page. Be inventive...
3. Do you have a good reason to believe your path is the shortest ? Explain why...



4. Explain with as much details as possible how solving a Rubik's cube may be achieved by searching a graph. What would be the nodes of the graph ? What would be the edges of the graph ??
5. Search the web (or make your own calculations) to tell me the number of nodes in this graph (it is a huge number)...
6. Characterize the graph according to the families we have seen in class (regular, complete, random, small-world network, etc). What would be the degree of each node ? Is this graph cyclic or acyclic ?? Directed or undirected ?
7. Calculate how many edges would be in this graph (it is a HUGE number)...

8. Imagine that you wanted to store a table defining this graph in its adjacency matrix representation. Search the web and look for storage devices. Any storage media you may want to buy... What is the smallest amount of money you could spend to store this table? I want a price quote for an actual storage device (with a web link to the page where you found it) and a calculation of the number of such devices you would have to buy. Please don't make me broke... Spend as little money as possible...
9. If you wanted to find the BEST solution to a particular scrambling of the cube, what search method would you use ?
10. It was recently proven that ``**God's number is 20**'', meaning that even in the worst possible scrambling, it is always possible to solve the cube within 20 face rotations. Give a short mathematical calculation showing that after traversing at most **16** edges on any path in the graph it is not even possible to reach all the possible nodes...
11. Look at the puzzle below. It is a 2x2x1 variation of the cube.



Give the complete information about the graph defined by this puzzle. How many nodes ? How many edges ? Draw the whole graph in its complete details. What is God's number for this puzzle ??

Have fun !