ECSE210L: Design and Analysis of Algorithms

Lab 3 (Week 3: January, 20 - 27, 2020)

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1. Testing problem

   In the testing unit of a robotic company "XYZ', robots are designed to test each other. One hacker has got the access of some of the robots of company 'XYZ' and he has introduced a virus into their systems. Now, these robots are unable to validate the functionality of the other robots. Considering the fact that all robots are lookalike and Testing coordinators of the company are unable to distinguish between robots accessed by hacker and other normal robots. They need your help in developing an algorithm to identify all the robots accessed by hacker in optimized number of testing. Calculate the complexity of the algorithm. Write an algorithm for this and execute it.

   Hint1: Consider the following cases:

Robo A says	Robo B says	Conclusion
B is good	A is good	both are good or both are bad
B is good	A is bad	at least one is bad
B is bad	A is good	at least one is bad
B is bad	A is bad	at least one is bad

   Design some test cases to validate your algorithm. Is it always possible to identify the correct robots or not. Justify your answer. Construct another method for identifying single correct robo in optimized number of testing (pairwise test).

2. Construct a heap using linked lists. with following operations: Make-heap (creates an empty heap), Insert, minimum, extract-min, and union. analyse the running time of the operations when operated on following conditions. lists are sorted, Lists are unsorted.