CMPSC 465 Fall 2024

Data Structures & Algorithms
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Recitation 4

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1. (Pouring Water)

   We have three containers whose sizes are 10 pints, 7 pints, and 4 pints, respectively. The 7-pint and 4-pint containers start out full of water, but the 10-pint container is initially empty. We are allowed one type of operation: pouring the contents of one container into another, stopping only when the source container is empty or the destination container is full. We want to know if there is a sequence of pourings that leaves exactly 2 pints in the 7- or 4-pint container.

   1. Model this as a graph problem: give a precise definition of the graph involved and state the specific question about this graph that needs to be answered.
   2. What algorithm should be applied to solve the problem?

2. (Uniqueness of linearization)

   Let $G = (V, E)$ be a DAG. Design an $O(|V| + |E|)$ time algorithm to decide if there is only one possible linearization for G. Prove that your algorithm is correct.