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COMP9101 Ass04

3. A large group of children has assembled to play a modified version of hopscotch. The squares appear in a line, numbered from 0 to n, and a child is successful if they start at square 0 and make a sequence of jumps to reach square n. However, each child can only jump at most $k < n$ squares at a time, i.e., from square i they can reach squares $i+1, i+2, \ldots, i+k$ but not $i+k+1$, and a child cannot clear the entire game in one jump. An additional rule of the game specifies an array $A[1, \ldots, n-1]$, where $A[i]$ is the maximum number of children who can jump on square i. Assuming the

children co-operate, what is the largest number of children who can successfully complete the game?(25 pts)

Hint: Connect every square i with squares $i+1, \ldots, i+k$ with a directed edge of infinite capacity. Now limit the capacity of each square appropriately and use max flow.

Q3.

This question is similar as Q1, we can build a graph, the vertex is each square. The super source is connected to square 0, which is the first square, the super sink in this graph is the last square, which is square n. The capacity of each vertex is A[i], then we can divide each vertex into two vertexes. Therefore, by running the max-flow algorithm, we can calculate the number of kids who can reach the last square. The time complexity of this question is also O((2n+2) ^3) = O(n^3)