CSC 211 – Practical 2 Report

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1. Introduction

The solution presented in this report summarises how to compute the number of pairs of babies that are at the creche at the same time., taking in their arrival and departure time, the solution is called Contact Tracing Algorithm.

2. Contact Tracing Algorithm Solution

- Input number of babies
- Input their arrival and departure times.
- Create an empty array, to store different times of babies who are at creche at the same time.
- Iterate trough the array.
- For each baby "x" in the array
    - For each baby "b" in the array starting from "x+1".
    - If the departure time of baby "k" is more than or equal to the arrival time of baby "b", and the arrival time of baby "b" is less than or equal to either, then add the pair "(x+1, b+1)" to the array of baby pairs.
- Print out the array of pairs that show babies who were at the creche at the same time.

> **This algorithm takes $O(n^2)$ time complexity because of the two nested loops that each go through the babies, The nested loop makes sure that the algorithm is able to compare every baby with every other baby that arrived after them.**

3. Explanation of Algorithm Solution

The problem asks for the distinct pairs of babies who are at the creche at the same time given their arrival and departure times. The algorithm involves looping trough every pair of babies and checking whether the times at which they arrive and leave, mix.

- The algorithm first prompts the user to give the number of babies, as well as the times at which each child arrives and leaves the creche. This information is then in arrays, one array for arrival times and one for departure times.
- Another array is created, say array "prs" to store different pairs of babies who are at the creche at the same time. The algorithm for determining if two babies are present at the same time, involves comparing the arrival time of each baby to the leaving time of another, and the same in reverse, if both comparisons show that times overlap, then is confirmed for sure that the babies are at the creche at the same time.

- The algorithm then loops trough each pair of babies, checking for an overlap of times, if there is, the overlapping pairs are added to the array “prs” . The nested loops are used to loop trough each pair of babies. The outer loop, loops through each baby, and the inner loop, loops through each baby through starting from the next one on the array. This ensures that babies are not checked twice.
- After all the process the overlapping pairs are shown on the console as outputs.

4. Response to bonus question