Title: Efficiently Solving Minimum Tourist Trips Using Graph Theory

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Introduction:

In an effort to find the minimum number of trips required to transport tourists between two cities connected by various roads, I explored several approaches by utilizing resources like ChatGPT and Stack Overflow. Working solo added to the challenge, as I lacked the immediate feedback and brainstorming benefits that come from pair programming.

Research and Challenges:

Initially, the problem seemed straightforward, but the complexity of ensuring the optimal path with varying capacities required a more robust solution. I sifted through numerous posts and discussions online, which introduced me to different algorithms used in similar problems. Each algorithm provided insights but none directly fit the unique constraints of my problem.

Algorithm Selection:

The breakthrough came when I realized that simply finding any path wasn't enough; the path needed to maximize the minimum capacity road used, which in graph terms is often solved using maximum flow algorithms. This realization redirected my focus towards understanding and implementing the Edmonds-Karp algorithm, an approach well-documented for its efficacy in network flow problems.

Implementation:

Utilizing C++ for implementation, I constructed a graph where cities were nodes and roads were edges with capacities. The core of the solution involved using a breadth-first search to continually update the maximum flow from the source to the destination city. By always selecting the path that maximized the smallest edge (in terms of capacity), I ensured that the flow was optimal.

Conclusion:

The final step involved calculating the minimum number of trips by dividing the total number of tourists by the capacity of the bottleneck edge in the optimal path, rounding up to account for any remainder. This project not only enhanced my problem-solving skills but also deepened my understanding of how theoretical computer science concepts can be applied to real-world logistical challenges.