IE 343 TERM PROJECT

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Introduction

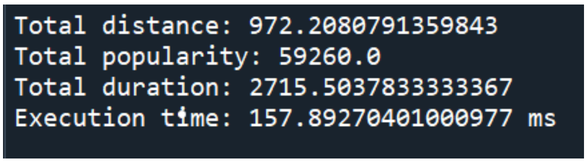
This study aims to solve Knapsack and Traveling Salesman problems using Python programming language. We used two data files named cities and song. The cities file contains latitude, longitude, and concert duration data, and the song file contains song name, popularity, and duration data. We have city and song classes to create their object instances.

Algorithmic Approach

We used the top-down algorithm to solve the Knapsack problem. We created a table with one more row than the number of songs and one more column than the concert duration and filled this table with zeros. We added one more row and column to account for the cases with zero items and zero capacity. We used a nested loop consisting of two "for loops" to implement the Knapsack algorithm. We applied the top-down algorithm by going through the elements of the table one by one with this nested loop. We used a "while loop" to find the songs we selected. The complexity of Knapsack is O(n^2).

We used the Nearest Neighbor algorithm to solve the Travelling Salesman problem. In our code, the cities we have been to are listed as True, and the cities we have not yet been listed as False. At the beginning of the tour, all cities were False. We added the first selected city to the tour, and then we completed the tour by going to the next closest city and visiting all cities. The complexity of a Traveling Salesman is O(n^2).

Output



```
Total distance: 972.2080791359843
Total popularity: 59260.0
Total duration: 2715.5037833333367
Execution time: 157.89270401000977 ms
```

Conclusion

We used the Knapsack algorithm for each city in the tour which we determined by using the Nearest Neighbor algorithm, in order to find the optimal songs based on the duration of the concert in that city. We calculated the total distance as 972, total popularity as 59260, total duration as 2715, and execution time as 157 ms.