CS 201: Data Structures II
Habib's Grocery Store

Tree Tacklers

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1 Group Members

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2 Data Structure

An **Exponential Tree** is a specific type of search tree that is ideal for storing and retrieving data efficiently, particularly when dealing with large and well-organized data sets. Unlike to conventional search trees, exponential trees feature an exponentially decreasing number of child nodes with each level, making it possible to store a large quantity of data in a simple and efficient structure. Each leaf node in the tree has a splitter value that is less than or equal to all the values in its subtree, and the leaf nodes are where data is stored. During a search, this splitter value aids in locating the way to the targeted leaf node. Also, to improve search efficiency, exponential trees use a data structure in the inner nodes that contains the splitters from the children.

3 Application

The exponential tree data structure is a type of data structure that can efficiently store and query a set of numbers, each with its own unique identifier or key. The structure is built on a tree-like hierarchy that allows for quick access to specific elements. Here are some examples of how the exponential tree data structure can be used:

Indexing Large Databases: Exponential trees can be used to index large databases, making it easier to search and retrieve information. Database queries can be optimised by using an exponential tree to create an index, resulting in faster query response times and improved database performance.
Information Retrieval: Exponential trees can be used in information retrieval systems, such as search engines. They can be used to store and retrieve information about documents or web pages, such as their titles, keywords, and other metadata.

Graph Algorithms: Exponential trees can be used in graph algorithms, which seek to find the shortest path between two nodes in a graph. It is possible to efficiently find the shortest path by traversing the tree by storing the graph data in an exponential tree.
Machine Learning Exponential trees can be used in machine learning algorithms like decision trees and random forests. They can be used to store and process large training datasets efficiently, enabling for the training of accurate and scalable machine learning models.

Overall, the exponential tree data structure has numerous applications in computer science and related fields. It is a powerful tool for efficiently storing and processing large datasets, allowing for the analysis and extraction of valuable insights from complex data.

4 Functionality

The project will represent the inventory of a grocery store. Like any grocery store, there will be a vast list of items with their prices and available quantity. The app will have 2 main functions, the first function will be searching the specific item we want from the list in O(logn) time. Once the item is retrieved, there will be an option to get it delivered to nearby areas along with the estimated delivery time using Dijkstra algorithm.

5 Datasets

We will be using the data set taken from Kaggle, this data set is based on inventory data for groceries. The data set has the following attributes:

InventoryId
StoreName
City
Area
ProductName
QuantitySold
QuantityAvailable
Cost
RetailPrice

Our basic requirements for the data set include InventoryId, ProductName, Price, and Quantity, so we might strip down some of these attributes depending on the development of our project.

6 Work Distribution

Item	Activity	ID
1	Making the Dataset and Frontend	aa0543
2	Implementing Dijikstra	sh06565
3	Implementing Exponential Tree	mm06501

7 Attribution

1. ChatGPT, a large language model trained by OpenAI, based on the GPT-3.5 architecture, provided the response to "What are some practical applications of Exponential Tree Data Structure." (Accessed on April 3, 2023).

2. Prashant Kulkarni. (2018). Inventory data for Grocery. (Accessed on April 3, 2023)

References

[1] OpenAI. *ChatGPT*. [Online]. Available: https://openai.com/chat . Last accessed: 26 Jan 2023. Prompt: how do i cite a chatgpt chat in bibtex format?