

# COP 5536 Spring 2024 Programming Project

## GatorGlide Delivery Co.

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### 1. Project description

GatorGlide Delivery Co. emerged as a tech-savvy beacon of efficient logistics inspired by the swift movements of the alligator. It is planning to elevate its software infrastructure to meet the growing demands of customers. The new system aims to optimize order management, delivery routes, and enhance overall efficiency.

Orders are served according to their priorities. Priority of an order is calculated using the following equation:

$$\text{priority} = \text{valueWeight} * \text{normalizedOrderValue} - \text{timeWeight} * \text{orderCreationTime}$$

where  $\text{valueWeight} = 0.3$ ,  $\text{timeWeight} = 0.7$ , and  $\text{normalizedOrderValue} = \text{order.orderValue} / 50$

\*A delivery might be out for delivery when this order has been created, i.e., the  $\text{ETA} > \text{order\_creation\_time}$  but is in the process of delivery. In that case, ensure that even though the current orders' priority is greater, it must not move in front of that.

### 2. Project Environment

The programming language used in this project is python.

We use ALV tree to trace and manage all the packages.

To run the program, execute **\$python gatorDelivery.py file\_name**

### 3. Structure of the program

The program includes two classes, Node and AVLTree.

Class **Node**:

Attribute:

# Node data

- **order\_id**
- **current\_system\_time**
- **orderValue**

- **deliveryTime**
- **ETA(Estimated Time of Arrival)**

# Key

- **priority**
  - o based on the equation in project description

# Node structure

- **left**
- **right**
- **height**

Method:

- **get\_path(orderId)**: return an array containing the path from orderId to root
- **get\_closest\_big(orderId)**: get the closet node which priority is greater than the current node

Class **AVLTree**:

Attribute:

- **root**: The root of the AVL tree
- **returnTime**: record the time when the delivery guy returns to the delivery center

Method:

# Core function

- **print(orderId)**: Prints the order details of the given order\_id.
- **print1(time1, time2)**: Prints all the orders that will be delivered within the given times (including both times) and are undelivered
- **getRankOfOrder(orderId)**: Takes the order\_id and returns how many orders will be delivered before it.
- **createOrder(order\_id, current\_system\_time, orderValue, deliveryTime)**: Creates the order, prints the ETA, and also prints which previously unfulfilled orders have been delivered along with their delivery times.
- **cancelOrder(order\_id, current\_system\_time)**: Cancels the order and updates the ETAs of all the orders with lower priority.
- **updateTime(order\_id, current\_system\_time, newDeliveryTime)**: Takes the current\_system\_time, order\_id, and the new delivery time. It updates the ETAs of all the orders with lower priority.
- **Quit()**: Print all the node left in the AVL tree and end the program.

# auxiliary function

- **getAllOrderInOrder(root, array)**: Return an array that list all the orders in order.
- **insert(root, node)**: Insert a new node in the AVL tree.
- **delete(root, priority)**: Delete a node with a specific priority in the AVL tree.
- **leftRotate(x)**: Perform left rotate in a AVL tree.

- **rightRotate(x)**: Perform right rotate in a AVL tree.
- **getHeight(root)**: Return the height of current node
- **getBalance(root)**: Return the balance of current
- **preOrder(self, root)**: Print the node in preorder. Used to trace the structure of the AVL tree.
- **getMinValueNode(self, root)**: Get the minimum node of a subtree
- **alreadyDelievered(current\_time)**: Get all orders that should have been delivered at the current time
- **printAlreadyDelievered(self, array)**: Print all orders that have been delivered at the current time

main():

Read the source file from the command prompt. Parse each command line and call the corresponding function. Store the output in a new output file. All output is written to a text file having filename as concatenation of input\_filename + "\_" + "output\_file.txt".