

***** Explanation_3*****

- The Huffman problem used class Node with attributes frequency, char, left, right.
- the implementation keep a dictionary of occurrence of each character.
- for key in dict(characters) the code uses min heap data structure to designated appropriate nodes to the characters.
- the root nodes are popped from the min heap and merged(add the freq and create new arbitrary node) till the length of heap is 1
- This 1 node object is a encoded tree.
- this data is then passed to the decoding function to decode the given data.

Methods used:

- > count_occurrence(): Counts the frequency of keys and create a dictionary[key=char] and value = freq. Time complexity is $O(n)$
- > create_min_heap(): give key and value create min heap by pushing the node in heap. Time complexity is $O(\log n)$
- > merge_low_freq_nodes(): Pops head and assign left and right node. Time complexity is $O(1)$
- > code_key(): assigns code to the character. since I look through all the node in tree Time complexity is $O(n)$

Time Complexity:

The time complexity is $O(n \log n)$

Time complexity for huffman_encoding method —> $n \log n$

Time complexity for huffman_decoding method —> $O(l)$ where l is the length of code.

Space complexity:

$O(\text{number of characters in the sentence})$