Manacher’s Algorithm

Time Complexity Analysis:-

**1.** The preprocessing step involves converting the input string into a new string with special characters inserted between each character and at the beginning and end. It takes O(N) time.

**2.** For each character, it checks its mirror position and expands outward to find the longest palindrome centered at that position. Since each character is visited only once, and the expansion process is done in constant time for each position, this step also takes O(N) time.

**3.** After finding the palindrome lengths for each position, the algorithm identifies the maximum length palindrome and its center.

It also takes O(N) time.

Finally, The time complexity of Manacher's Algorithm is O(n), where n is the length of the input string. This linear time complexity makes it highly efficient, especially compared to naive approaches that have a higher time complexity, such as O(n²) or O(n³).