**Time complexity Analysis for Rabin-Karp Algorithm**

1) **Preprocessing:**

The preprocessing step involves computing the hash value of the pattern . This step takes O(m) time, where m is the length of the pattern.

2) **Sliding Window:**

Computing the hash value values of all substrings of size m in the input . This step takes O(n) time, where n is the length of the input.

3) **Pattern Matching:**

Comparing the hash values of the pattern and each substring of size m in the text .If the hash values of pattern and substring matches , perform a character-by-character comparison to confirm the match.

This step takes O(n) time.

4) **Overall Complexity**:

The total complexity is **O(m+n**) since both preprocessing and pattern matching steps contribute O(m) and O(n) respectively.

When the hash value of the pattern matches with the hash value of a substring of the input but the substring is not the actual pattern then it is known as spurious hit.

The worst-case time complexity occurs when the spurious hits occur a number for all the substrings in the text the time complexity will be **O(mn).**