Bonus Homework #1

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Program Output:

Generating Test 1: Correct DFA Table

search = "GACGA"

State | G | A | T | C |

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0 | 1 | 0 | 0 | 0 |

1 | 1 | 2 | 0 | 0 |

2 | 1 | 0 | 0 | 3 |

3 | 4 | 0 | 0 | 0 |

4 | 1 | 5 | 0 | 0 |

5 | 1 | 0 | 0 | 3 |

search = "AAGCATTTAAGCA"

State | G | A | T | C |

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0 | 0 | 1 | 0 | 0 |

1 | 0 | 2 | 0 | 0 |

2 | 3 | 2 | 0 | 0 |

3 | 0 | 1 | 0 | 4 |

4 | 0 | 5 | 0 | 0 |

5 | 0 | 2 | 6 | 0 |

6 | 0 | 1 | 7 | 0 |

7 | 0 | 1 | 8 | 0 |

8 | 0 | 9 | 0 | 0 |

9 | 0 | 10| 0 | 0 |

10 | 11| 2 | 0 | 0 |

11 | 0 | 1 | 0 | 12|

12 | 0 | 13| 0 | 0 |

13 | 0 | 2 | 6 | 0 |

Generating Test 2: Instance of Subsets

Your randomly generated text is:

ATATACGGACCTCTTCGCTTCAGGCGAGGATGAGGGGATCTATGAAGACCGTAGCAGAATTTTGAGAACTGCACACTTGTTATAGTATCCTAGAGGAGAA

For the substring "ATA" There were 3 matche(s) found.

For the substring "ATAT" There were 1 matche(s) found.

For the substring "ATATA" There were 1 matche(s) found.

For the substring "ATATAC" There were 1 matche(s) found.

For the substring "ATATACG" There were 1 matche(s) found.

For the substring "ATATACGG" There were 1 matche(s) found.

For the substring "ATATACGGA" There were 1 matche(s) found.

For the substring "ATATACGGAC" There were 1 matche(s) found.

Generating Test 3: Test of Time

Running Test for text length of 100000.

The average time the search of 100000 characters took: 0.3404 seconds.

Running Test for text length of 200000.

The average time the search of 200000 characters took: 0.6748 seconds.

The algorithm is consistent with the run time complexity of O(n + m3) where n is the length of the string to be searched and m is the length of the search string. As the text to be searched doubled and the search string length remained constant the average it time it took to complete was slightly less than twice as much.