Big O Analysis

In the context of Big O analysis, it is well-established that **Merge Sort** has a time complexity of O(nlogn), while **Bubble Sort** exhibits a time complexity of O(n^2). To experimentally validate these complexities, I utilized a custom `SysTick` interrupt to measure the execution time required to perform these sorting algorithms.

As illustrated in the accompanying figures, the time taken for sorting arrays of various lengths is recorded in a tabulated format for both algorithms. For **Merge Sort**, the data demonstrates a clear proportionality to an nlogn function, with the constant factor derived and presented. In the case of **Bubble Sort**, the observed times align closely with a quadratic function (n^2), and a best-fit quadratic equation was calculated to minimize the error between theoretical and observed values.

In summary, as the array length increases, the measured execution times for these algorithms adhere to their respective theoretical growth rates. The results confirm that the runtime of **Merge Sort** is proportional to nlogn while the runtime of **Bubble Sort** grows quadratically with the input size.

x_2	y_2
5	5
10	14
15	24
20	34
25	46
30	57
35	69
40	82
45	96
50	111
55	122
60	137
65	151
70	165
75	179
80	193
85	210
90	225
95	241
100	256

x_2	y_2
5	4
10	15
15	34
20	60
25	95
30	141
35	192
40	249
45	317
50	391
55	469
60	561
65	654
70	761
75	868
80	989
85	1119
90	1250
95	1392
100	1541

Kuadratik Regresyon

DENKLEM
$y = 0.152016x^2 + 0.250909x - 3.43158$

İSTATİSTİKLER KALINTILAR
$R^2 = 1$ e_2 çiz

$mx \log x$

$m = 1.27$

−10 10